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historic structure report
archeological data section

september 1988

FORT McHENRY
SEAWALL

NATIONAL MONUMENT AND HISTORIC SHRINE
MARYLAND

COMPLETED

VL 4/9?

HISTORIC STRUCTURE REPORT

Archeological Data Section

Seawall

Fort McHenry National Monument and Historic Shrine

Maryland

by

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National Park Service
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and

The American University
Washington, D.C.

Sponsored by the National Park Service
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Administrative Information

This investigation was sponsored by the National Park Service through Cooperative Agreement No. CA-2000-4-0001 with American University. The general purpose of this cooperative agreement is to facilitate the execution of the mandate given the National Park Service by means of the Historic Sites Act of 1935 (P.O. 74-292, 49 Stat. 666; 16 USC 461-467), which is "to make necessary investigations and researches in the United States related to particular sites . . . or objects to obtain true and accurate historical and archeological facts and information concerning the same." The cooperative agreement, more specifically, provides experience and training to National Park Service employees and university staff and students in the application of archeological research to historical restoration projects and to planning and construction projects in historically sensitive areas.

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INTRODUCTION

Fort McHenry, constructed between 1799 and 1802 as part of the first system of American seacoast fortifications, is located on Whetstone Point in Baltimore, Maryland (Figure 1). Whetstone Point, now known as Locust Point, is a peninsula surrounded by the Middle Branch and the Northwest Branch of the Patapsco River.

The need for a seawall to protect the shoreline around the fort was recognized as early as 1814, and by 1816 work had commenced. The seawall, built in stages after 1816, has successfully protected the shore, but time and the weather have taken their toll. Approximately 3,400 feet of the wall have been extensively damaged by tidal movement, wave action and the wash from marine traffic. Periodically, the seawall has suffered severe damage during storms and hurricanes, and has been repaired many times since its construction. Currently, the National Park Service is planning to rehabilitate approximately 2,000 feet of this historic seawall (Table 1).

Prior to rehabilitation, an archeological investigation was sponsored by the National Park Service through a cooperative agreement with The American University. Archeological fieldwork was conducted in the spring and fall of 1986 and the winter of 1987. The purpose of these excavations was to test for associated features, original ground surface, historic deposits, and historic structures immediately adjacent to the seawall and to determine the significance of those cultural resources. Additionally, architectural data concerning the construction and deformation of the seawall was recovered prior to seawall rehabilitation. The results of these archeological investigations constitute this Archeological Data Section of this Historic Structure Report.

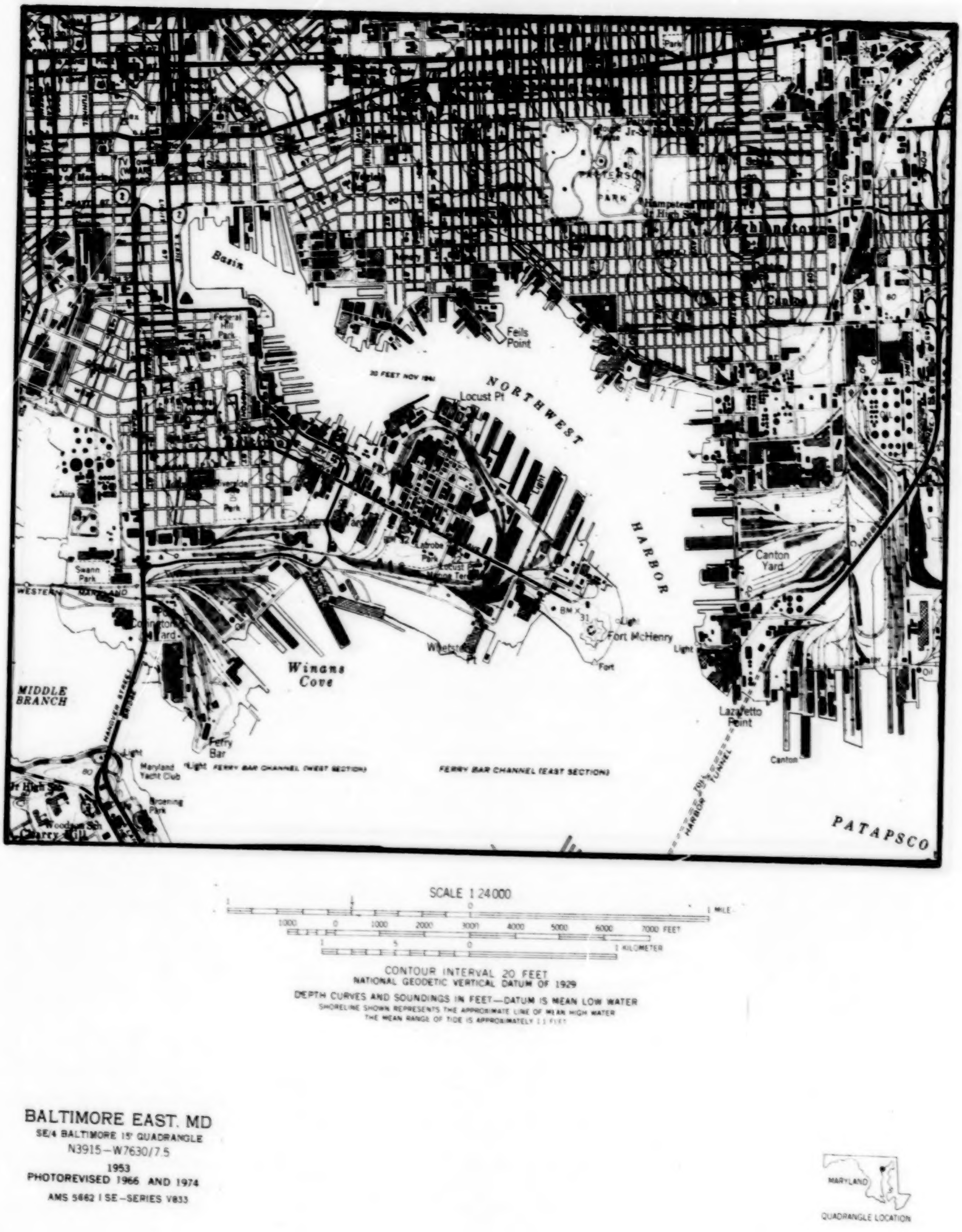

Figure 1. Vicinity map.

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Table 1. Construction Location and Description.

Station Number	Proposed Construction
10+00-18+48.77	Excavate trench behind seawall 1 to 6 feet wide to base of wall, line trench with filter cloth, backfill with stone
18+48.77-22+84.09	Fill voids in wall Pin stones in wall
22+84.09-32+03.74	No work
32+03.74-38+59.35	Fill voids in wall Realign capstones
38+59.35-park boundary	No work

Note: See Figure 2 for location of station numbers.

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BACKGROUND STUDIES

Prehistory

Extensive prehistoric remains have been found throughout the Chesapeake Bay region of Maryland. Sites dating to the Archaic and Woodland periods have been identified, and isolated projectile points from the Paleo-Indian period have been found. No prehistoric component was discovered during the current archeological investigation, although the potential for finding a prehistoric site at Fort McHenry remains.

History

The following historical overview has been summarized from Bouslog (Bouslog 1987).

Alarmed by the threat of a British invasion from the Chesapeake Bay, the citizens of Baltimore began erecting fortifications on Point Whetstone in February, 1776. Fort Whetstone, an earthen, five-pointed "star" fort was the first harbor defense built on the site of present-day Fort McHenry. The threat of invasion subsided, and it was not until conflict occurred in Europe following the French Revolution, that the United States became concerned again with seacoast fortifications. In 1794 Congress passed legislation authorizing and funding the construction of a national system of simple and inexpensive harbor fortifications (Lewis 1979:21). Fort McHenry, constructed between 1799 and 1802 on the site of old Fort Whetstone, is probably one of the best known of these American coastal forts.

Fort McHenry, named for Secretary of War James McHenry, was expanded and fortified during the War of 1812. The capture of Washington, D.C. on the 24th of August, 1814 prompted renewed military preparation in Baltimore. After burning Washington, the British fleet sailed north up the Chesapeake Bay with the intention of taking the City of Baltimore. Attacked by the British fleet under the command of Admiral Cochrane, Fort McHenry successfully defended Baltimore by withstanding a 25-hour bombardment on September 13 and 14, 1814. The British navy withdrew and their plans for capturing Baltimore were abandoned.

Francis Scott Key, a prominent Georgetown lawyer who was arranging for a prisoner's release, observed the bombardment from a American vessel on the Patapsco River. Moved by the sight of the flag still waving over the fort after the bombardment, and by the courage of the fort's garrison, Key was inspired to write the poem "The Star Spangled Banner." This poem, later set to music, became the United States National Anthem in 1931.

Although best known for its role in the War of 1812, Fort McHenry remained active following the war. In the peacetime years before the Civil War, the fort underwent several changes and improvements. A burst of construction activity in 1829 was prompted by the need to reestablish military discipline, which had lapsed somewhat during the peacetime years (Thompson and Newcomb 1974:31). The basements were filled, second stories were added, the roofs changed from gable to shed and the outer battery was constructed.

In April, 1861, sympathy for the confederacy was strong in Baltimore. In order to protect roads, railroads and telegraph lines between Washington and the north, federal troops occupied Fort McHenry, thus ensuring that lines of communication remained open. Fort McHenry also served as a union detention center, where confederate soliders and Southern sympathizers were held before being shipped to permanent prisons.

After the Civil War improvements were made to the fort by adding underground magazines and bombproofs and installing 8, 10, and 15 inch Rodman Cannons.

Between the years 1866 and 1912 the fort underwent mostly minor repairs. Living conditions for both officers and enlisted men worsened as the fort's drainage system failed, leaving standing pools of stagnant water and ill-functioning privies. Work on the new water battery stopped, emphasizing the declining importance of Fort McHenry as a coastal defense.

By 1912 Fort McHenry was no longer an active military post. The garrison was transferred that year to Fort Strong, Massachusetts and the fort was turned over to the Quartermaster's Department. Within five years, however, the fort was needed again as a military hospital. The army built a 3,000 bed general hospital to administer to casualties during World War I. General Hospital No. 2 and its associated buildings occupied nearly every foot of the fort's grounds. After the war the hospital was razed and the fort's historical landmarks left intact.

In 1925, Fort McHenry was authorized as a national park under the administration of the United States Army, at which time restoration work was begun. In 1933, the War Department transferred the fort to the Department of the Interior.

Previous Investigations

The Historic Structure Report, Historic Data Section for the seawall was completed by Brown in 1985. Research for the report focused on data relating to the construction and repair of the seawall. Specific data from this report as it pertains to the archeological investigation of the seawall has been condensed below (Table 2).

Previous archeological investigations at Fort McHenry have been conducted by Rutsch (1974), Aivazian (1982), Stokinger (1981) and Joseph and Cheek (1985). These investigations focused either on fort drainage problems (Rutsch; Joseph and Cheek) or on structures and features within the fort (Aivazian; Stokinger).

Table 2. Chronology of Seawall Construction and Repair (from Brown 1985:58-68)

May 14, 1814 -	first mention of need for stone wall to secure the lower or water battery
Dec. 4, 1816 -	work had commenced on seawall
Dec. 31, 1817 -	1,460 feet of seawall completed: 3-foot foundation, 4 feet high, 4-6 feet thick
June 1, 1829 -	"A sufficient quantity of bricks can be obtained from the old seawall in front of this work, and from old Fort Covington without cost to the Government" to build quarters.
Oct. 29, 1838 -	commenced operations on August 1st, on the seawall-1550 feet of wall, 4.5 feet high, have been built exclusive of the foundations, which vary from eighteen inches to two feet deep
Feb. 9, 1858 -	plan to extend seawall to the south
May 31, 1875 -	formation of beach along seawall by wharf which is unhealthy
Sept. 18, 1876 -	storm damaged wharf; the seawall was washed badly
July 12, 1881 -	repairs behind seawall are "rough appearing"
Aug. 20, 1889 -	"dangerous holes" appear in seawall near low water line, which cannot be filled until the low water season in autumn
Aug. 30, 1893 -	storm on August 28 destroyed wharf, damaged earthworks and carried away extensive portions of the seawall
Oct. 20, 1893 -	a storm on October 13 further damaged seawall; several sections measuring from 20-30 feet have been opened; wall openings made in August storm now measure 75 feet in length; tide rose 3 feet above seawall
Sept. 14, 1895 -	the "filling in" behind new seawall will soon be completed, and surfaces ready for being covered with "street sweepings" or equally good material for growing grass for protection of slopes
Aug. 1896 -	contract submitted entitled "Building a Sea Wall and Making Repairs at Fort McHenry"

Table 2 (continued)

Aug. 3, 1896 -	earth behind the seawall is caving in several places, notably along the southeastern face, due to the action of the waves through the bottom of the wall
Sept. 3, 1937 -	removal of 70 feet of seawall damaged in spring 1937 storm
Nov. 14, 1974 -	bidding documents for rehabilitation of seawall by National Park Service
Aug. 5, 1975 -	contract requirements for seawall rehabilitation; started March 3, 1975, completed May 29, 1975
Sept. 13, 1979 -	seawall sustained major damage from Hurricane David; damaged segments dismantled and rebuilt

No archeological excavations were conducted immediately behind the seawall but investigations near the seawall have been performed (Smith 1958; Rutsch, 1974; Joseph and Cheek, 1985). Hubert Smith in 1958 excavated an area from the ravelin toward the seawall. The trench ended inside the seawall trail, and nothing of significance was found. In 1974, Rutsch visually inspected the seawall for drainage pipes and found several pipes penetrating the seawall were found (Rutsch 1974:9). In 1984, Joseph and Cheek excavated a 3 foot by 20 foot machine test on the fort side of the seawall trail to expose the 1836 postern drainage pipe discovered by Rutsch. This is an 18-inch cast-iron drainage pipe approximately 30-inches below ground surface that extends from the postern gate entrance to the seawall (Joseph and Cheek 1985:29).

RESEARCH DESIGN AND METHODOLOGY

The archeological investigation of the seawall was performed in three phases. Each phase was part of an overall archeological testing and mitigation plan conducted within the framework of an explicit research design based primarily on historic data and existing conditions. Controlled excavation units and machine tests were located to obtain both architectural and archeological data, specifically, 1) to determine if the existing shape of the seawall is as constructed/repaired or if the wall is presently being deformed by natural or other causes, and 2) to determine the presence/absence of significant archeological deposits adjacent to the seawall.

Field Methods

Detailed architectural data concerning the construction of the seawall was recovered from both controlled and machine-excavated units. All controlled excavation units were dug using hand tools in 0.5-foot levels within observed strata whenever possible. All soil was screened through 1/4-inch hardware cloth and all artifacts were collected. The excavation of each unit was documented in field notes, drawings and photographs.

Machine tests were excavated by a small backhoe. The soil from these tests was not screened, but observed artifacts were collected. These units were also documented in field notes, drawings, and photographs. All controlled excavation units and machine tests were backfilled.

Laboratory Methods

All artifacts were catalogued at the Applied Archeology Center in Rockville, Maryland. Each artifact was cleaned, inventoried, and assigned a catalog number. This number includes the provenience of the object and other catalog information.

After the artifacts were washed and labelled, they were separated by material and placed in plastic zip-lock bags within the original field paper bag. Special artifacts with specific conservation concerns, such as military buttons, were given to the conservator for treatment. All artifacts, field notes, maps and photographs will be stored at the park.

Interpretations of all excavation units and artifacts were based on the strata found in each unit. During analysis, it was possible, using excavation records and profiles, to match arbitrary excavation levels with the strata. Those levels that combined two or more strata were so noted in the analysis. Detailed artifact analysis was only conducted on artifacts found in strata undisturbed by 20th century construction. An artifact inventory and strata summary of all excavation units and backhoe trenches are included in Appendices A and C.

Artifacts from the controlled excavation units were interpreted separately from the machine tests due to the different excavation and artifact collection methods employed. Artifacts from adjacent excavation units were combined during analysis. These units were: Excavation Units 2 and 3; Excavation Units 4, 5, A and C; and Excavation Units 6 and 7. Artifacts were organized into eight groups, generally based on South's classification system (South 1977). The eight artifact groups are: kitchen, bone, architectural, personal, arms, furniture, miscellaneous and modern material culture. The artifact samples from Excavation Units 1 and B are too small to be statistically valid and were not included in the statistical analysis.

Phase I

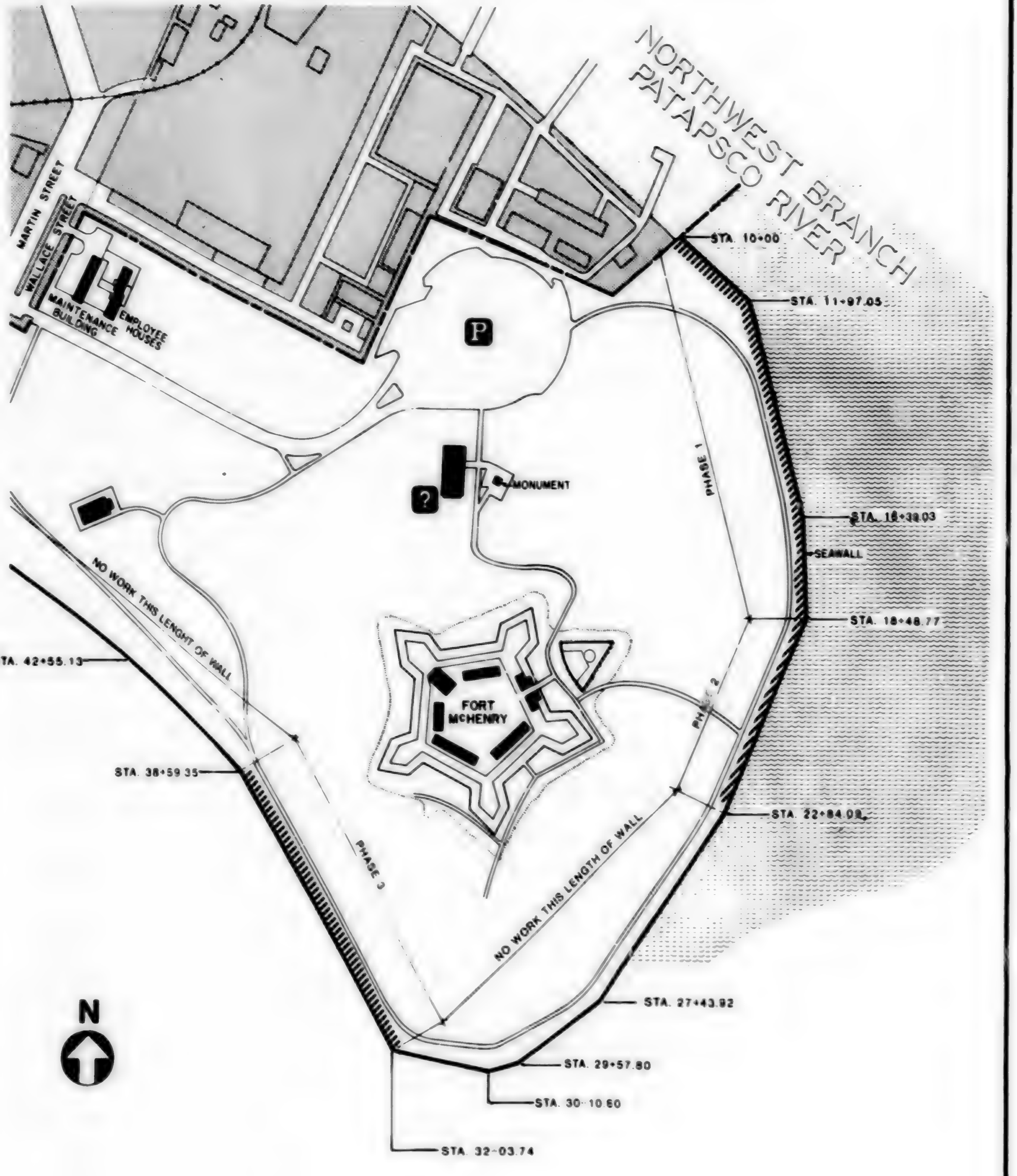
The goal of the first fieldwork phase, conducted between March 24-26, 1986 and April 7-May 2, 1986, was to test for subsurface evidence of features and other structures within the area to be effected by the rehabilitation of the seawall. Prior to initiating fieldwork, an examination of historic maps and documents suggested the locations of several former facilities on or near the seawall, including wharves, docks, privies, batteries, a firing range, hospital buildings and other unidentified structures. At present there are no standing structures near the seawall.

Four five-by-five foot controlled excavation units were located in proposed construction areas where the presence of structures and features were indicated on historic maps (Figures 2 and 2b). Excavation Units 4 and 5 were located near Station 15+25 to test for evidence of the north end of the water battery shown on an 1888 map (Brown 1985: 95) (Figure 3). Excavation Units 6 and 7 were located near Station Number 32+03 where an unidentified structure was shown on the 1888 map. This area is identified as a rifle range on a 1912 map (Brown 1985:99) (Figure 4).

The south end of the water battery was not tested because it was located outside the impact area. An unidentified structure on the 1888 map near Station Number 27+44 was also not tested because it was out of the proposed construction area. Historic references to the locations of privies along the seawall were vague and could not be pinpointed. Systematic machine trenching (Phase II) was used to test for evidence of these and other features not noted specifically in the historic record.

Phase II

The second fieldwork phase, conducted between September 22-29, 1986, consisted of the systematic testing of the entire impact area to discover features that were not noted in the historic record. Machine testing was scheduled for fall, 1986 to minimize the disturbance to summer visitors and to allow for the preliminary analysis of the Phase I fieldwork. Testing consisted of the excavation of backhoe trenches placed at an interval of approximately 100 feet along the entire impact area (Figures 2 and 2b). Eighteen machine tests, each about three feet wide and five feet long, were excavated either parallel or perpendicular to the seawall and examined (Table 3).



Key

▨ Project areas.

See Figure 2b for enlargement showing excavation units, machine tests and mitigation areas.

(Not to Scale)

Figure 2. Location of Project Area. Fort McHenry National Monument and Historic Shrine, Package Number 149.

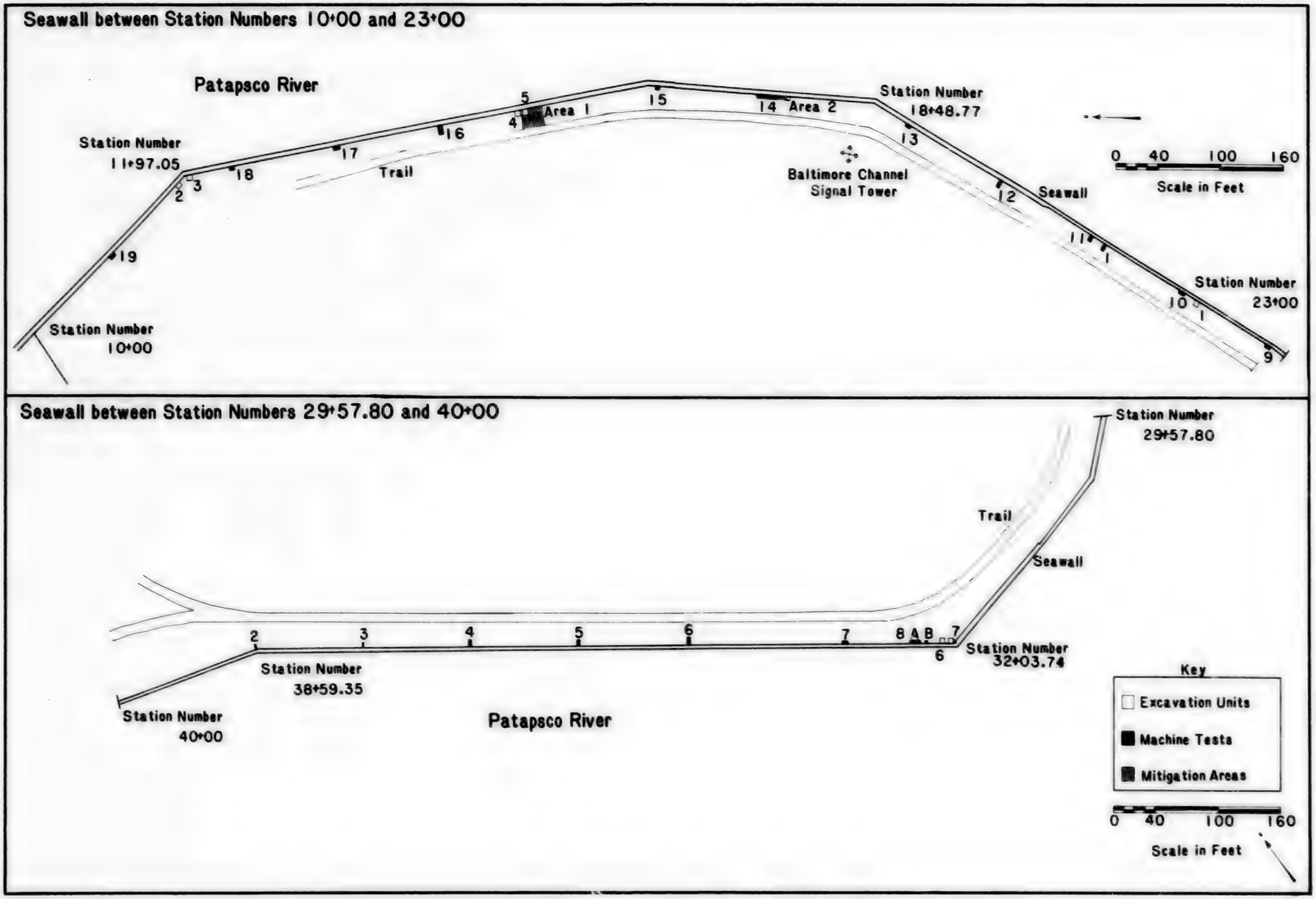


Figure 2b. Enlarged sections of the seawall showing locations of Excavation Units, Machine Tests and Mitigation Areas. See Figure 2.

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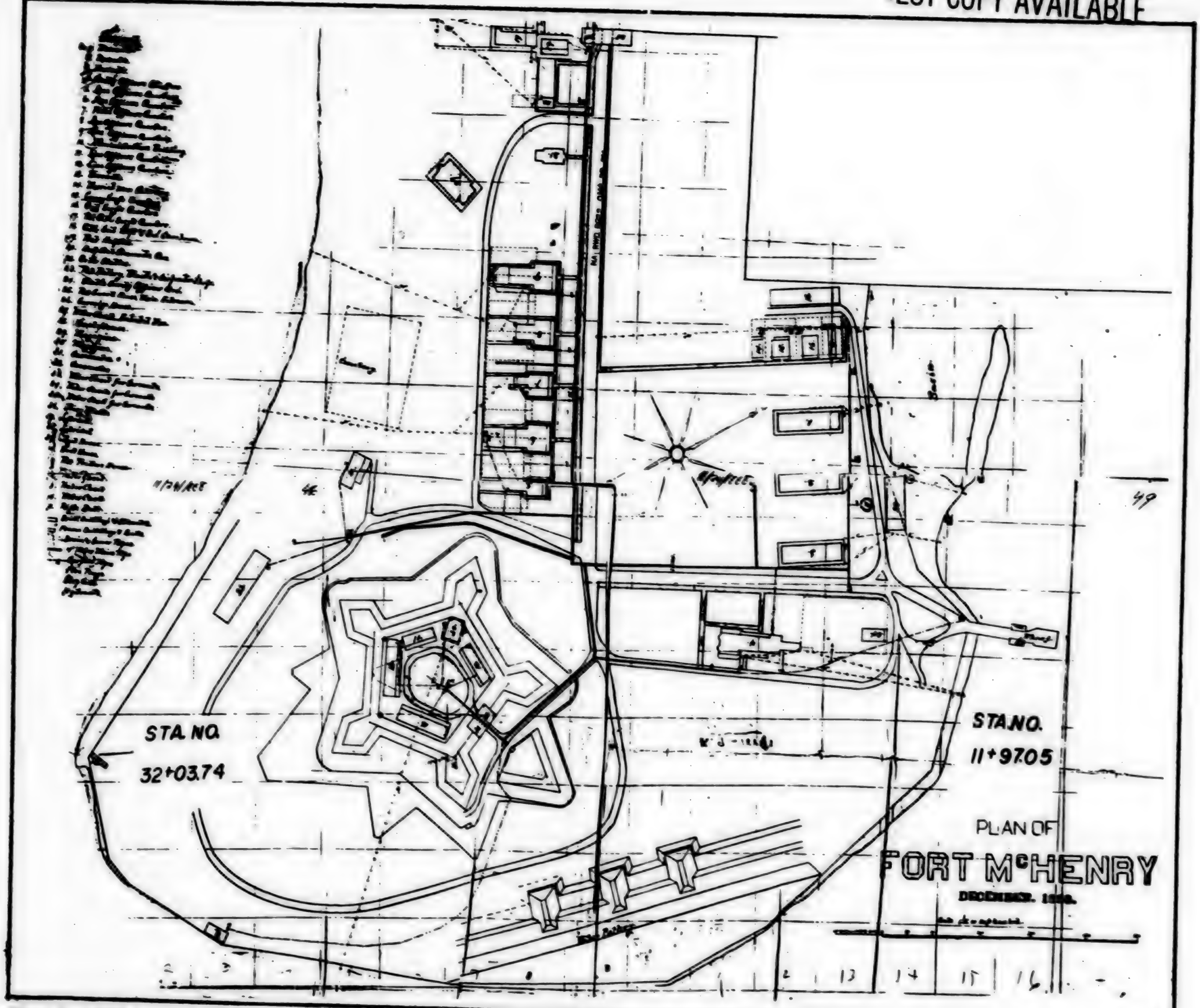

Figure 3. 1888 map, Fort McHenry (Brown 1985:95).

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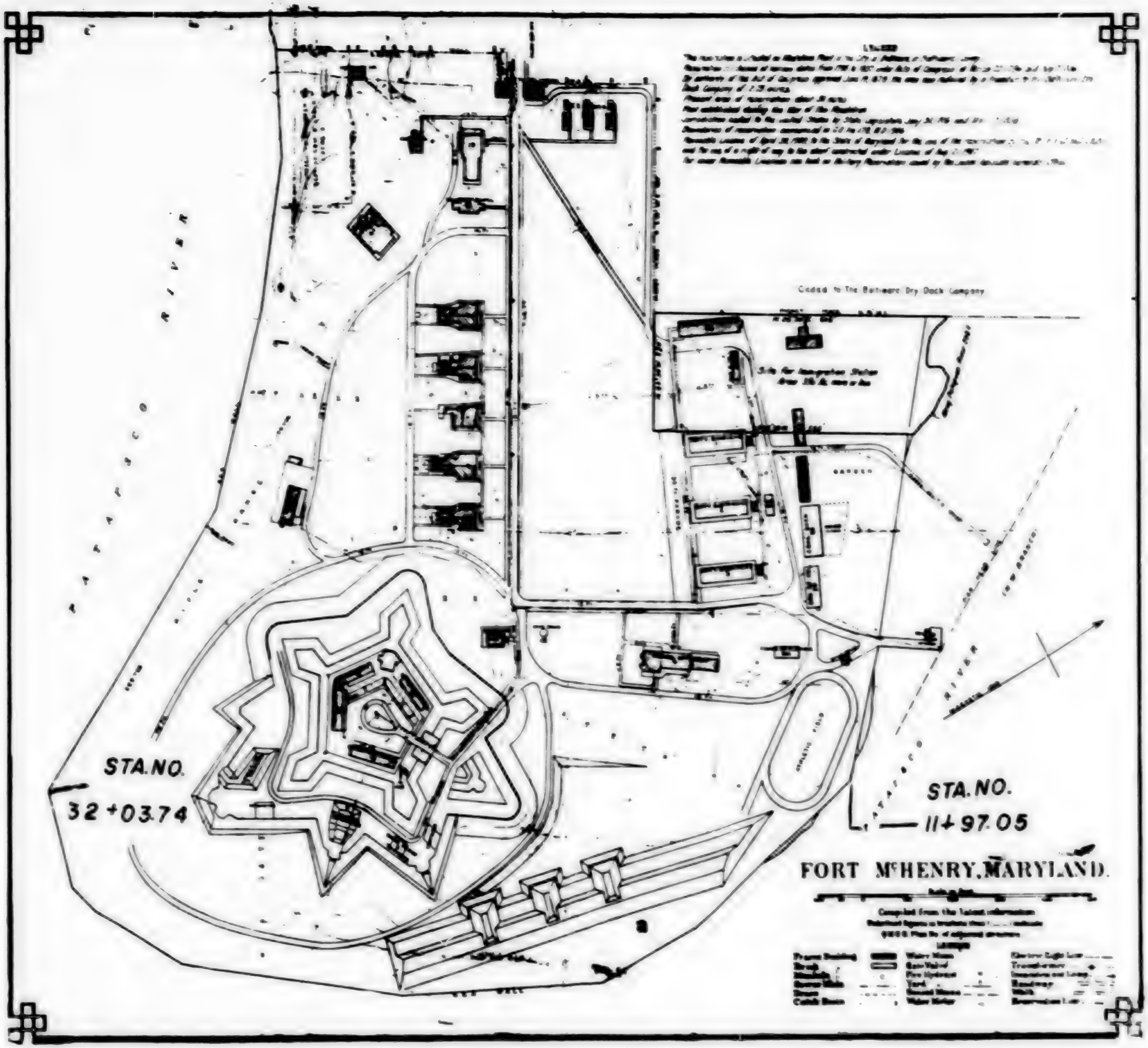

Ceded to The Baltimore Dry Dock Company
STA. NO.
32+03.74
STA. NO.
11+97.05
RIVER
FORT McHENRY, MARYLAND.
Compiled from the latest information

Figure 4. 1912 map, Fort McHenry (Brown 1985:99).

Table 3. Location and Orientation of Machine Tests

Station No.*	Machine Test	Orientation to Seawall
10+97	Trench 19	Parallel
12+39	Trench 18	Parallel
13+39	Trench 17	Parallel
14+39	Trench 16	Perpendicular
16+48	Trench 15	Parallel
17+48	Trench 14	Parallel
18+48	Trench 13	Parallel
19+84	Trench 12	Perpendicular
20+84	Trench 11	Perpendicular
21+84	Trench 10	Parallel
22+84	Trench 9	Parallel
32+30	Trench 8B	Parallel
32+39	Trench 8A	Parallel
33+05	Trench 7	Parallel
34+58	Trench 6	Perpendicular
35+59	Trench 5	Perpendicular
36+59	Trench 4	Perpendicular
37+59	Trench 3	Parallel
37+59	Trench 2	Parallel

Phase III

Potentially significant historic resources were discovered during both Phases I and II. A mitigation plan for these resources was developed based on the existing research design, the results of testing, and design information provided by DSC-TEA Project Architect Tom Fields. According to Fields (personal communication with Seidel, November 17, 1986) current plans for rehabilitation between Station Numbers 32+03.74 and 38+59.35 did not require excavation behind the seawall. Consequently, no mitigation was needed in the vicinity of Station Number 32+03, where evidence of a firing range had been discovered during Phase I testing. Resources found at Station Number 15+25 and 17+48, were to be impacted by construction, so Phase III, mitigation, was carried out in February, 1987 (Figures 2 and 2b).

The resources at Station Number 15+25 consisted of a deposit containing artifacts dating to the early 19th century. The deposit was discovered in Excavation Unit 5 during Phase I, approximately 2.5 feet below the top of the seawall. During the February 1987 work, a backhoe was used to remove approximately 1 to 2 feet of modern fill from an area measuring about 20 feet long by 15 feet wide between the seawall and the seawall trail. Three five-by five foot controlled excavation units were then dug (Excavation Units A, B, and C).

Work at Station Number 17+48 focused on a masonry feature discovered in the September 1986 excavations. A possible stone foundation, found in Backhoe Trench 14, was re-exposed during mitigation in February 1987 in an attempt to identify and define it. At this time, another machine test, Backhoe Trench 20, measuring approximately 5.5 feet wide and 32 feet long, was excavated parallel to the seawall, between Station Numbers 17+40 and 17+72. The feature was then exposed by shovel and trowel.

RESULTS AND INTERPRETATIONS

Controlled Excavation Units

Excavation Unit 1. Excavation Unit 1 was located at Station Number 22+03 as an architectural test to determine if the step on the exposed side of the seawall was an original architectural feature, or if it was the result of wall deformation.

Historic and recent fills were encountered in Strata A through E. All strata sloped toward the seawall. Strata A and B contained recent artifacts, such as wire nails, plastic, and styrofoam. A 1945 quarter was found in Stratum A. Stratum C contained a high amount of burned material, including cinders, slag, and ash. The presence of glassy and vesicular slag suggested that the material originated at a site where high temperatures were being produced, such as at an iron furnace. Below this industrial fill was a layer of coal. Stratum E, dense, mottled clay, contained a great deal of modern trash, such as plastic, cellophane and styrofoam. These materials were obviously washed-in through voids in the wall. Stratum F, dense gray clay with distinctive multi-colored mottles, was a natural stratum that was extremely difficult to excavate. Observed artifacts from this stratum were collected.

Mortar found between the seawall stones indicated that the wall had recently been repaired, possibly during the 1975 rehabilitation of the seawall (Brown 1985:55). The mortaring extended 2.1 feet below the top of the capstone. This indicated that Strata A through E were disturbed during the 1975 repairs. These strata probably represent fill that was placed behind the wall after repairs or to mitigate subsidence. Stratum F, the only stratum that did not exhibit any evidence of recent disturbance contained only seven artifacts. This sample size was too small to be statistically valid, therefore, no further artifact analysis was conducted.

The unit was excavated to a depth of 4.5 feet, but the base of the seawall could not be reached. The seawall is not being deformed in this location, and the "step" is a cultural feature of the seawall (Figure 5).

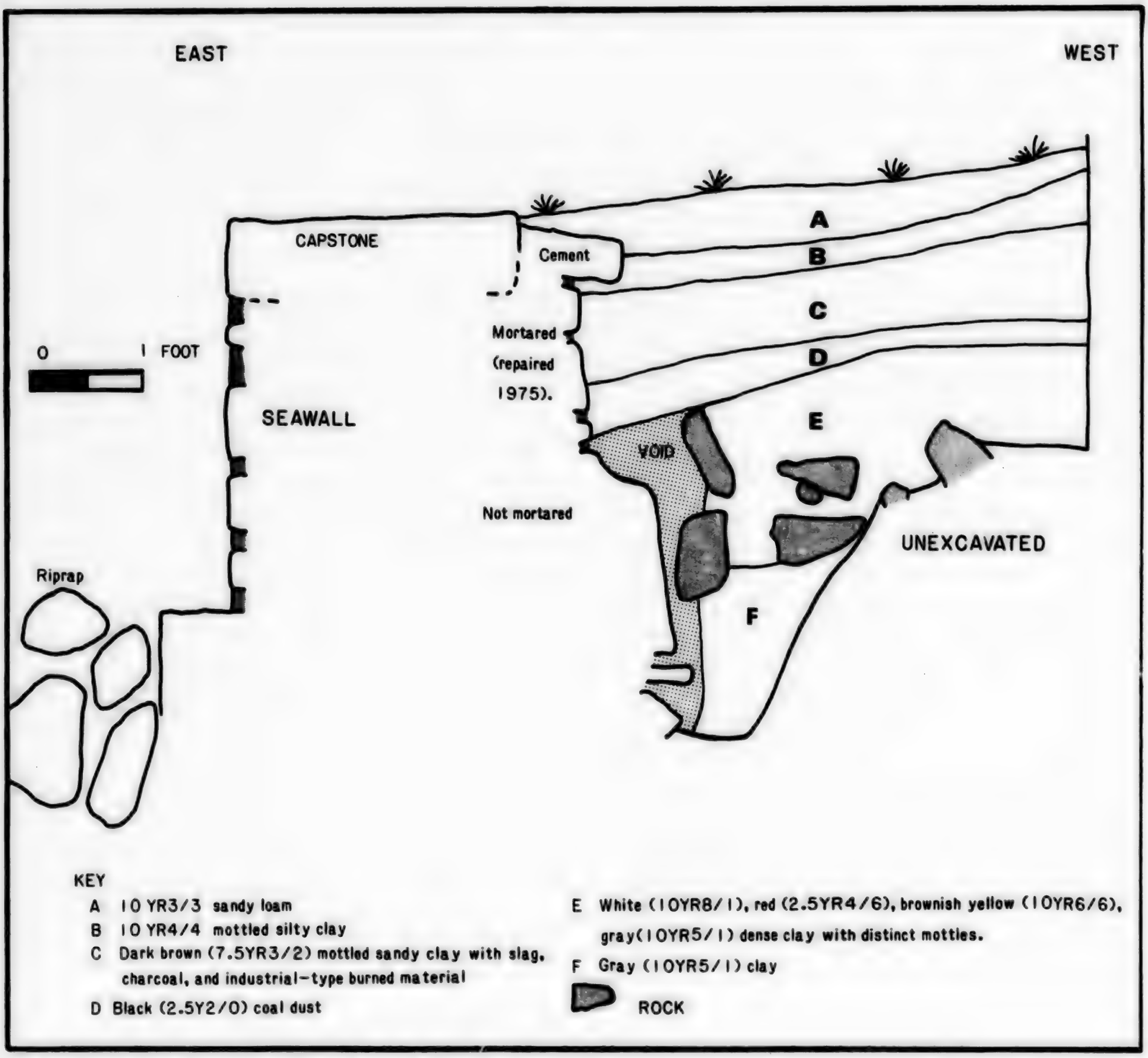

EAST
WEST
A
B
C
D
E
F
CAPSTONE
Cement
Mortared (repaired 1975).
Not mortared
0 1 FOOT
SEAWALL
VOID
UNEXCAVATED
Riprap
KEY
A 10 YR3/3 sandy loam
B 10 YR4/4 mottled silty clay
C Dark brown (7.5YR3/2) mottled sandy clay with slag, charcoal, and industrial-type burned material
D Black (2.5Y2/0) coal dust
E White (10YR8/1), red (2.5YR4/6), brownish yellow (10YR6/6), gray(10YR5/1) dense clay with distinct mottles.
F Gray (10YR5/1) clay
ROCK

Figure 5. Excavation Unit I South Profile.

The void in Figure 5 is a typical hydrolic characteristic of the seawall and is seen in many of the tests. These voids have occurred because tidal movements and periodic severe storms have washed out pockets of soil behind the seawall. This is why, in part, the seawall has deteriorated and needs stabilization. It is through these voids that modern artifacts, especially floating plastic, have washed in and "disturbed" historic deposits. Although every attempt was made during excavation to keep these artifacts separate, some recent artifacts from these voids were collected with the historic deposits. These obvious intrusions were not considered in the artifact analysis and interpretations.

Excavation Units 2 and 3

Excavation Units 2 and 3 were located at Station Numbers 11+84.65 and 11+98.85, respectively. Both excavation units contained a thick deposit of oyster shells. The hinges on the oysters had been broken, indicating that they had been shucked and then later used as fill. A proposal entitled "Building a Sea Wall and Making Repairs at Fort McHenry" was submitted in August, 1896. It stated:

> Oyster Shells - Throughout its entire length the space immediately back of the wall is to be filled with good clean oyster shells to about three feet above mean low water, and extending back at the top a distance of about three feet from the wall, thence sloping off at the natural slope. The fill of oyster shells may at the option of the engineer be extended to other parts of the area to be filled (Brown 1985: 134).

Although this proposal referred to the construction of the seawall near the cemetery, the description fits that of the oyster shell deposit encountered in Excavation Units 2 through 5. The use of oyster shell as fill may have been a standard practice in the construction of the entire seawall. As late as the 1870s, shells were used around the fort on walks and roads (Thompson and Newcomb, 1974: 70). The oyster shells found in Excavation Units 2 through 5 may represent the construction phase of the original seawall. In Excavation Units 2 through 5, all the strata above the oyster shell deposit have been disturbed, probably from the 1975 rehabilitation of the seawall. More importantly, artifacts from the strata below the oyster shell deposit date to the early 19th century. Historic artifacts were uncovered immediately below this deposit in each of the four excavation units where it was present.

In Excavation Unit 2, the oyster shell deposit began approximately 0.8 feet below ground surface, was approximately 2 feet thick and extended 4 feet back from the wall. At the base of this deposit, 2.8 feet below the top of the capstones, the seawall widens by 0.75 feet. The wall remains at this width to the base of the excavation unit, 4.8 feet below the top of the capstones.

Immediately below the oyster shell deposit were two strata, I and J. Stratum I (Level 8) was light yellowish brown (10YR 6/4), wet clayey loam. Stratum J, (Level 9) was black (10YR 2/1), mucky, tar-laden silty clay.

In Excavation Unit 3, the oyster shell deposit began 1.2 feet below ground surface and was 1.6 feet thick. The shell deposit extended at least 5 feet back from the wall. Below this deposit were two strata, I and J, which were excavated together as one level (Level 7). Stratum I was a thin deposit of banded yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) clays. Stratum J consisted of sand, decayed mortar and plaster, and brick fragments.

The seawall footing could not be exposed in Excavation Unit 3. A stone rubble layer prevented the excavation of that half of the unit adjacent to the wall. These stones, including some large, cut granite blocks, were apparently left from the construction or repair of the seawall. Stones similar to these were found in other tests along the seawall.

A total of 84 artifacts were recovered from Strata I and J in Excavation Units 2 and 3 (Table 4). Over 14 percent of this assemblage consisted of architectural artifacts, including window glass and slate; plaster and mortar fragments were noted but not counted in the analysis. The kitchen group was also well represented, and accounted for over 33 percent of the assemblage. This group included shell-edged pearlware,

Table 4. Artifact Summary, Historic Deposit

	E.U. 1		E.U. 2 & 3		E.U. 4, 5, A, C		E.U. 6 & 7		Total	
	n	%	n	%	n	%	n	%	n	%
Kitchen	3	42.8	28	33.3	570	43.2	68	12.1	669	34.0
Bone	0	-	26	31.0	257	19.6	40	7.1	323	16.4
Architectural	1	14.3	12	14.3	410	31.3	21.5	38.4	638	32.4
Personal	0	-	-	-	18	1.4	6.0	1.1	24	1.7
Arms	0	-	-	-	2	0.2	110	19.6	112	5.7
Furniture	0	-	-	-	0	-	2	0.4	2	0.1
Miscellaneous	1	14.3	12	14.3	32	2.4	66	11.8	111	5.6
Modern	2	28.6	6	7.1	20	1.6	53	9.5	81	4.1
TOTAL	7	100.0	84	100.0	1,309	100.0	560	100.0	1969	100.0

transfer-printed and undecorated whiteware, and bottle glass. A substantial number of bones, both butchered and unmodified, were also recovered, amounting to over 31 percent of the assemblage. Over 14 percent of the sample consisted of miscellaneous artifacts such as copper wire, unidentified iron fragments and concretions, and a lead strip fragment. Six modern artifacts (7 percent) were also recovered from Strata I and J; it is likely that these artifacts washed-in through the seawall. No artifacts from the personal, arms, or furniture groups were recovered.

The relatively high percentages of the kitchen and bone groups suggest that this assemblage represents kitchen refuse. Despite the presence of architectural artifacts, no structural evidence of a building was present. It is likely that during the early 19th century refuse from the fort was transported to the shoreline for disposal.

Excavation Units 4, 5, A, B, and C. Excavation Units 4 and 5 were located at Station Numbers 15+11.4 and 15+22, respectively, to test for evidence of the north end of the water battery shown on the 1888 map. Excavation Units A, B, and C were located near Station Number 15+25 to mitigate the resources found during testing in Excavation Unit 5.

In Excavation Unit 4, Strata A through H contained a mix of historic and recent artifacts dating from the 19th to 20th centuries. Mortar found between the seawall stones indicated that the wall at this location, like the section found in Excavation Unit 1, had been repaired in 1975. The mortar extended one foot below the top of the capstones. Strata A through H have, therefore, been disturbed, as late as 1975, when the wall was mortared.

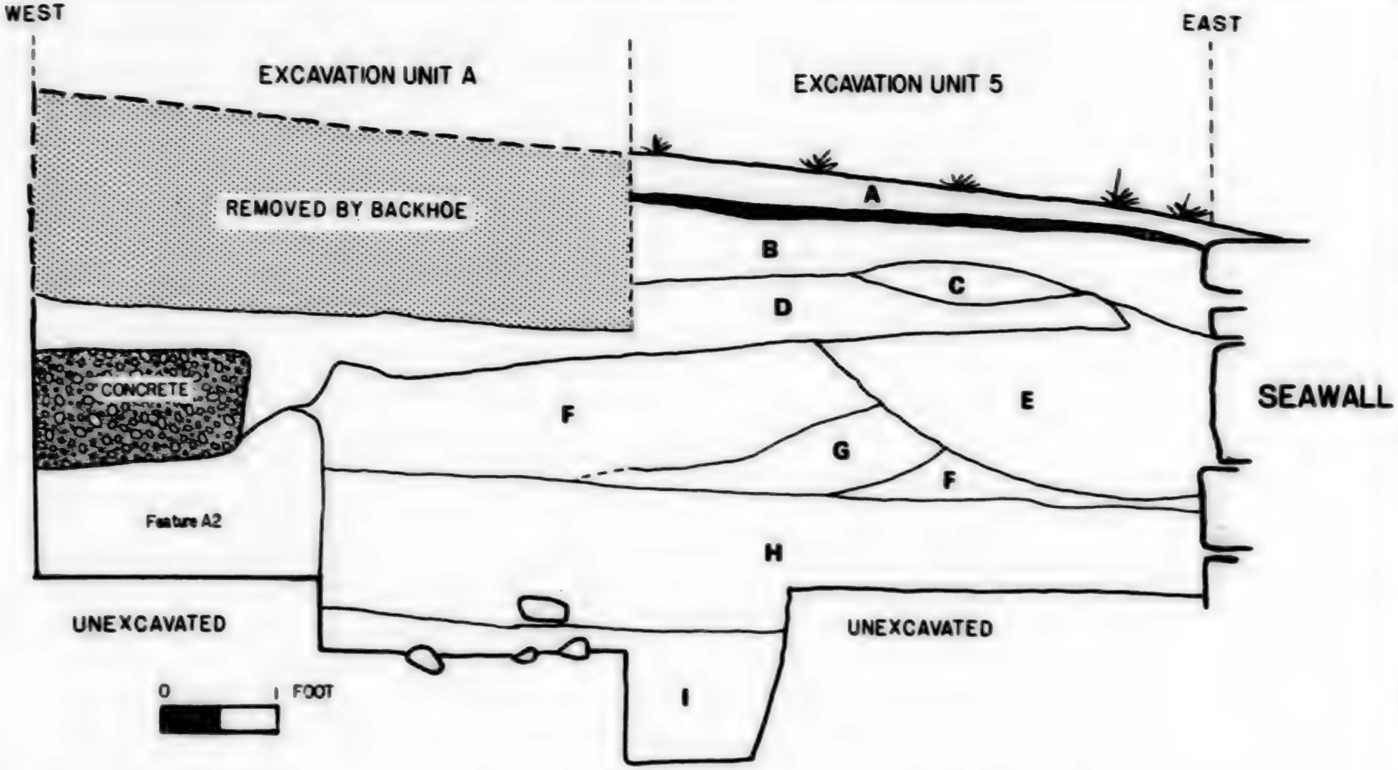
Below these disturbed strata, and adjacent to the seawall, was the oyster shell deposit. This deposit extended to the base of the excavation unit, approximately 2.8 feet below the top of the capstones. This unit could not be excavated deeper because of the high water table.

At the base of the excavation unit, the oyster shell deposit filled a thin trench along the seawall. This trench (0.3 feet wide) contained many artifacts that entered through the voids in the seawall during high tides. To the west of this trench were two strata, K (Level 6, bag 42) and L (Level 6, bag 43). Stratum K, dark yellowish brown (10YR 4/4) sandy clay, was removed with oyster shells. Stratum L, dark yellowish brown (10YR 4/4) sandy clay with distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/6) sandy clay, was excavated separately. The artifacts found in this stratum included redware, stoneware, creamware, transfer-printed whiteware, undecorated whiteware, bottle glass fragments, window glass fragments, cut and unmodified bones.

Strata A through D in Excavation Unit 5, were construction fill that was probably disturbed during the 1975 rehabilitation of the seawall. Artifacts found in these strata included undecorated whiteware fragments, bottle and window glass, cut and wire nails, plastic, a copper alloy two-holed button, oyster shells, and bone. Below these disturbed upper strata, the eastern half of the unit contained a thick oyster shell deposit, while the western half contained brown silty clay (Figure 6).

The oyster shell deposit (Stratum E) contained a few modern artifacts that probably washed in through the wall. The brown silty clay (Stratum F) contained a mix of historic and modern artifacts. These included creamware, pearlware, whiteware and redware, bottle and window glass, cut and wire nails, aluminum foil, plastic and styrofoam. The modern artifacts were found in situ and suggested that the whole unit had been recently disturbed to this depth, possibly during the 1975 repairs. It is possible that these artifacts washed in through voids in the seawall.

Stratum H (Level 7), a slightly sandy clay (7.5 YR 4/4 dark brown) with pockets of 10YR 4/1 dark gray clay, was found below the oyster shell deposit and contained ceramics, glass, bone and other artifacts dating to the early 19th century. This historic deposit started approximately 2 feet below the top of the seawall and was about 1.1 feet thick and extended beyond the limits of the excavation unit.



KEY

A	10YR 3/3 dark brown silty loam.
B	10YR 4/4 dark yellowish brown clayey silt mottled with a 2.5 YR 4/6 red clay and some cinders: micaeous
C	A lens of 10YR 2/0 coal/slag and cinders which did not cover the entire unit.
D	10 YR 3/3 dark brown silty sand loam containing some cinders, oyster shells and a vast quantity of small angular rocks which appeared to be dumped in as fill.
E	10YR 3/3 brown silty clay matrix surrounding densely packed oyster shells.
F	7.5YR 4/6 strong brown silty clay mottled with a 7.5YR 5/8 silty clay and 2.5 YR 4/6 clay and a 10R 3/6 dark red clay
G	7.5YR 4/6 clayey sand pocket which cuts through Stratum F
H	7.5YR 4/4 dark brown slightly sandy with pockets of 10YR 4/1 dark grey clay, brick, mortar, charcoal
I	7.5YR 5/4 dark brown slightly sandy wet clay containing brick and mortar rubble.
▬	A very thin layer of small rocks
⬬	Stone

Figure 6. Excavation Units 5 and A, North Profile.

Ceramics found in this stratum included: a Rockingham/Bennington ware fragment; creamware; handpainted, annular and undecorated pearlware; fingerpainted, transfer-printed, shell-edged, underglazed painted, and undecorated whiteware; redware, stoneware; soft-paste porcelain and an unidentified buff-bodied earthenware. Other artifacts found in this stratum included: a copper alloy military button (dating to 1814-1821 according to Albert 1976:56), a hand-painted porcelain marble, a .43 caliber bullet, and cut nails.

At the base of Stratum H, a shovel test pit was excavated in the northwest corner of the unit in an unsuccessful attempt to reach the base of the seawall. Artifacts in this shovel test pit (Stratum I) included redware, porcelain, stoneware, creamware, pearlware, whiteware, bottle and window glass, butchered and unmodified bones, cut nails and a white clay pipestem fragment.

Based on the preliminary field and laboratory analysis from the controlled excavation units and the machine tests mitigation was performed at two locations (Mitigation Areas 1 and 2) along the seawall. Although a significant resource, the remains of the firing range was discovered at Station Number 32+03, mitigation was not required due to design changes.

Mitigation in Area 1 centered on the resources discovered in Excavation Unit 5 near Station Number 15+25. This excavation unit contained a deposit of early 19th century artifacts, approximately 2 feet below the top of the seawall. A backhoe removed approximately 1 to 2 feet of disturbed fill from an area measuring about 20 by 15 feet between the seawall and the seawall trail (Figure 7). Three five-by-five foot excavation units were then dug by hand (Excavation Units A, B, and C).

The historic deposit was found not only in Excavation Units A, B, and C but also in Mitigation Area 2 near Station Number 17+48. Although this deposit was found in the excavations at both Station Number 15+25 and 17+48, it was not present in a backhoe trench excavation at Station

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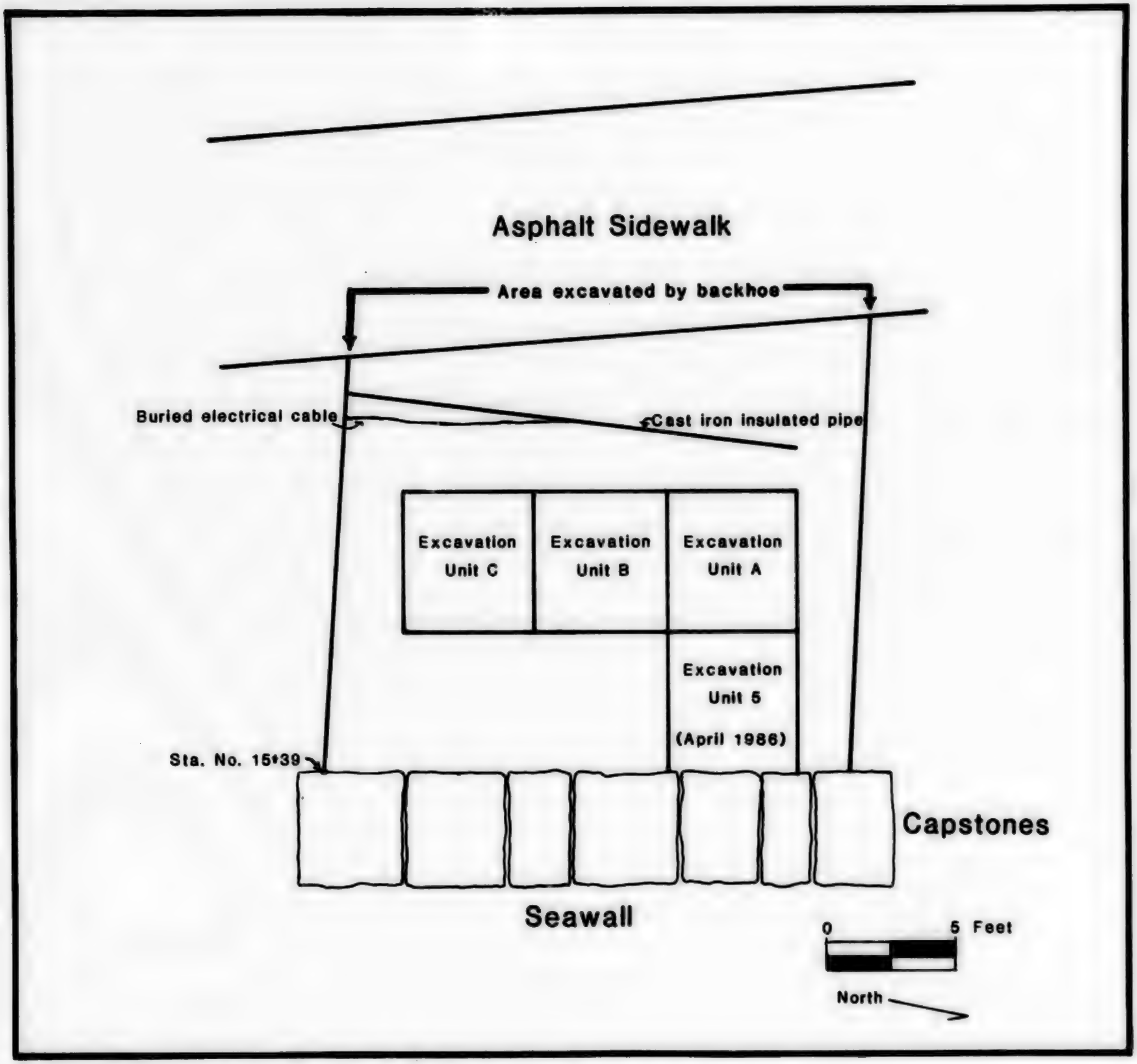

Figure 7. Location of Excavation Units A,B, and C.

Number 16+48, or in any of the excavations between Station Number 10+00 and 15+25. This suggests that the deposit may exist intermittently from Station Number 15+25 to at least 17+48, and may extend to the end of the construction area at Station Number 18+48.77.

On the average, this deposit started approximately 2 feet below the top of the seawall and was about 1.2 feet thick. Its width varied, extending from the inside edge of the seawall to approximately 7.5 feet at Station Number 15+25. In the vicinity of Station Number 17+48, the deposit did not lie adjacent to the seawall and extended beyond the western limit of the excavated area. At Station Number 15+25, the deposit was truncated by a 20th-century feature (Figure 8). The deposit may represent the grade and shoreline during the early occupation of Fort McHenry, prior to the construction of the seawall. The quantity and types of artifacts recovered suggest that this was a refuse area in the early 19th century.

A total of 1,318 artifacts were recovered from the early 19th century deposit in Excavation Units 4, 5, A and C (Table 4). The deposit was recorded and left intact in Excavation Unit B. Therefore, no artifacts from Excavation Unit B were used in the artifact analysis. Kitchen, bone and architectural artifacts dominated the artifact assemblage. Unlike the refuse deposit found in Excavation Units 2 and 3, personal artifacts, such as shell and glass buttons, white clay pipe fragments, and a hand-painted porcelain marble were recovered. A total of ten copper alloy buttons (Figure 9) were also found, six of which could be identified and dated (Table 5).

Excavation Units 4, 5, A, and C had the highest percentages of kitchen and personal artifacts of all the excavation units. Artifacts from the kitchen group constituted over 43 percent of this assemblage and included 438 ceramic fragments and 132 bottle glass fragments. Of the twenty-nine types of historic ceramics recovered from all the excavations, twenty-eight were found in this deposit. Using the Mean Ceramic Date formula (South 1977:217) a date of 1832 was calculated. In addition to the kitchen artifacts, over 19 percent of the artifacts from the sample were butchered, modified (burned or broken) and unmodified

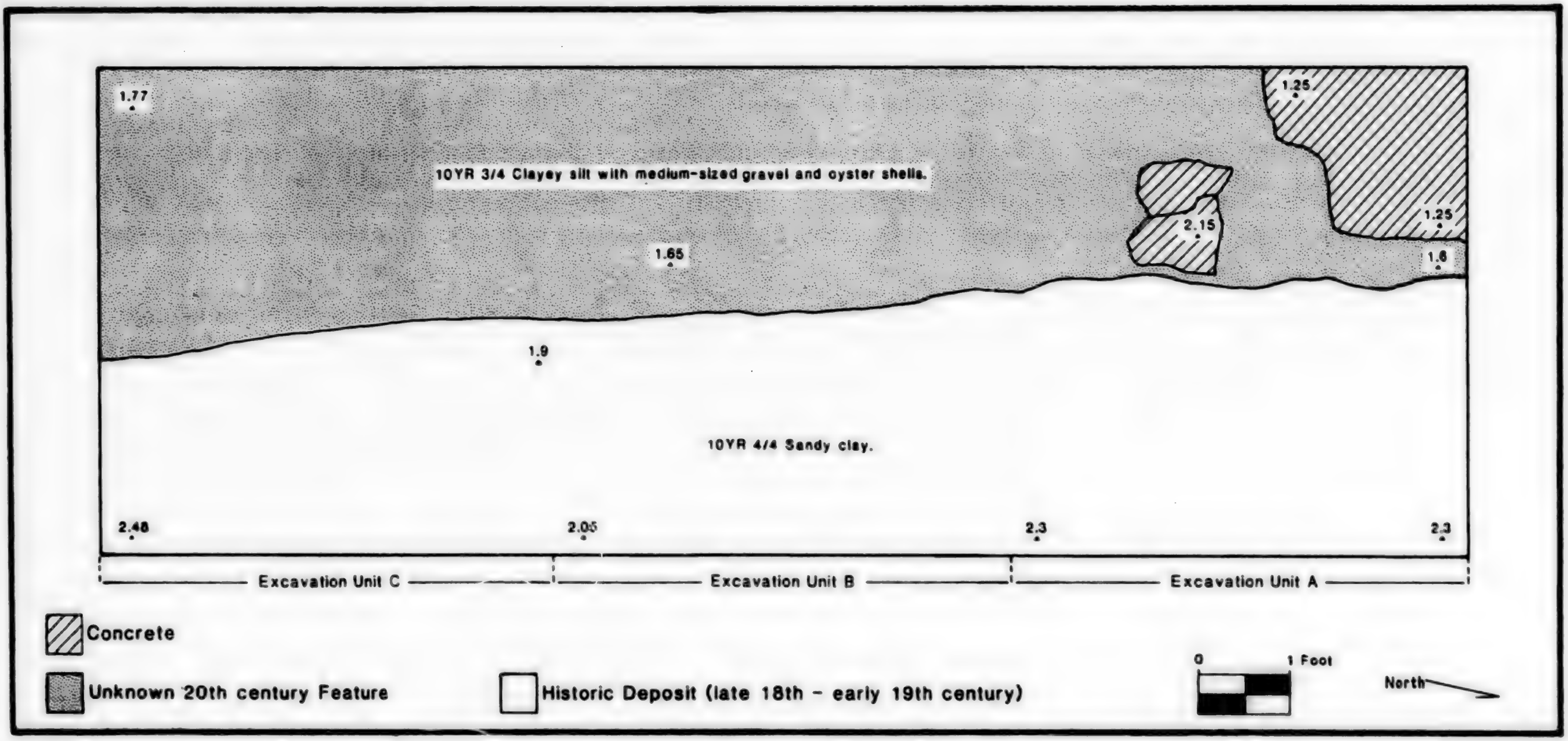
1.77
1.25
10YR 3/4 Clayey silt with medium-sized gravel and oyster shells.
2.15
1.25
1.65
1.6
1.9
10YR 4/4 Sandy clay.
2.48
2.05
2.3
2.3
Excavation Unit C
Excavation Unit B
Excavation Unit A
Concrete
Unknown 20th century Feature
Historic Deposit (late 18th - early 19th century)
0
1 Foot
North

Figure 8. Excavations A, B, and C. All depths are measured from below the top of the seawall (top of capstones).

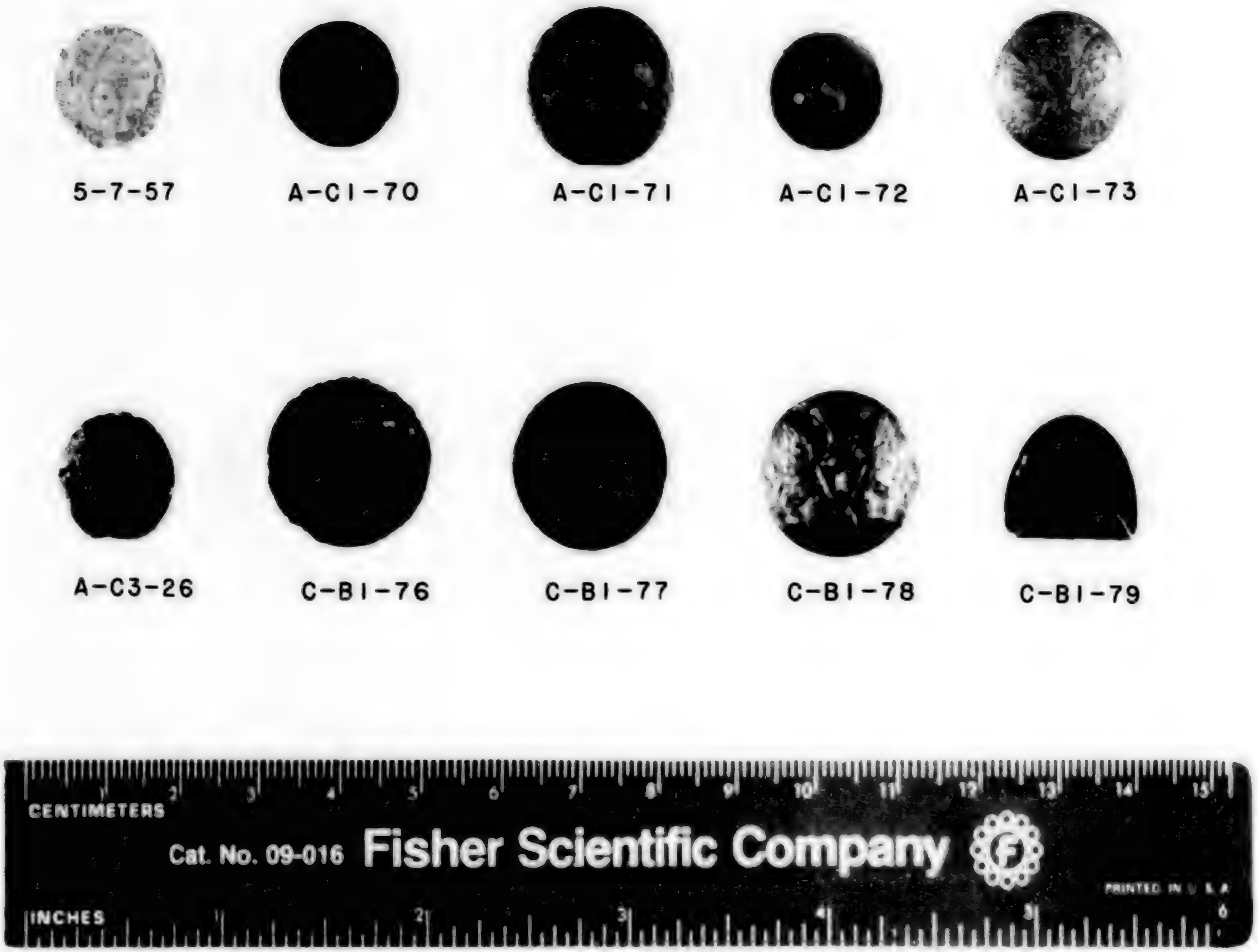

Figure 9. Military buttons.

Table 5

Copper Alloy Buttons, Excavation Units 5, A and C*

CATALOG NO.			DESCRIPTION	IDENTIFICATION		
	Cross Section	Diameter (mm)	Device	Backmarks	Military Units	Date
5-7-57	Disc	14	an eagle, standing on a cannon, a pile of ten cannon balls under the muzzle	None	Artillery Corps	1814-1821
A-CI-70	Disc	15	intertwined follated script letters RA with the number 2 within oval below	None	2nd Regiment of Artilleriats	1811-1813
A-CI-71	Convex	19	a spread eagle, facing right, with branch in right talon, arrows in left talon	*L.H.& SCOVILL*	Unknown	1811-
A-CI-72	Disc	14	None	LONDON	Unknown	?
A-CI-73	Convex	17	a spread eagle, facing right, with branch in right talon, three arrows in left talon	None	Unknown	?
A-C3-26	Convex	15	None	None	Unknown	?
C-B1-76	Disc	20	a follated script letter A, the regimental number in oval below cannot be read	None	Regiment of Artilleriats	1811-1813
C-B1-77	Disc	20	an eagle, standing on a cannon, a pile of ten cannon balls under muzzle, the inscription CORPS below	None	Artillery Corps	1814-1821
C-B1-78	Convex	19	a spread eagle, facing right, with shield on breast impressed with the letter I, branch in right talon, and three arrows in left talon	SCOVILLS & CO/ WATERBURY	Infantry	1821-1854
C-B1-79	Disc	17	None	PLATED	Unknown	?

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*All recovered from early nineteenth century deposit.

bones. Over 31 percent of the artifact assemblage consisted of artifacts from the architectural group, which included window glass fragments, square cut and unidentified nails. No wire nails were found, and brick, plaster, and mortar samples were collected.

The high percentages of the kitchen, bone and architectural groups, combined with the highest percentage of personal artifacts found at the site, suggests that this assemblage is an early 19th century refuse deposit. Despite the high percentage of architectural artifacts, no structural evidence of a building was found. It seems likely that this refuse represents material transported from the fort to the shoreline and deposited where it would be removed by the tides. Privies were located along the seawall for this same reason.

Based on the archeological investigation behind the seawall and further documentary research it appears that the present stone seawall is not the original seawall at Fort McHenry. An 1819 plan and profile of Fort McHenry, drawn by William Tell Poussin, is the earliest known map to show the grounds surrounding the fort and the upper and lower batteries. This map clearly shows the seawall extending from the southern boundary of the fort to the upper battery, and the presence of counterfort construction. These counterforts or buttresses were present along 880 feet of the seawall and were generally spaced every 35 feet along this length. The counterforts extended back from the seawall 6 to 7 feet and were 5 feet wide. No archeological evidence of these structures was encountered in the recent investigations.

Additional evidence to support this theory was found in the historic and cartographic record. While researching the history of the seawall for the Historic Structure Report, Sharon Brown found an interesting reference dated June 1, 1829. In a letter to Major General T. S. Jesup, the commanding officer at Fort McHenry, Captain M. M. Payne, proposed to add second stories to the quarters with "bricks" obtained from "the old seawall in front of this work, or from old Fort Covington, without cost to the Government . . . " (Brown 1985:7). Brown speculated that "perhaps the first seawall construction was of brick and was, at some later period relaid as a stone wall" (Brown 1985:7).

Brown recommended an archeological investigation to determine if the remnants of an older brick seawall could be located behind the present stone seawall. However, a cartographic comparison of historic maps with a 1984 existing conditions map indicates that the old seawall is approximately located under the existing seawall trail.

The relocation the seawall created needed land at the fort. During the 1830s the boundaries of the fort were expanded at the recommendation of several engineers who believed the fort was vulnerable to attacks staged from tall buildings on adjacent private property (Brown 1985:9). By 1837, a total of 28 acres of private property was purchased (Brown 1985:10). But purchasing land was only one way to acquire property. By 1834, the seawall had been extended from the upper battery to the northern boundary of the fort, near the wharf (Figure 10). The seawall was not built in this location until the 1830s because this area was "sheltered by the point and a bank forming 30 to 60 feet from the shore" (Brown 1985:6). A comparison of the 1834 map and the 1984 map shows that the seawall had been relocated further out into the Patapsco River. In the process, the area behind the the seawall, a previously sheltered indentation along the shoreline, was filled in, thus creating additional land at the fort. The refuse deposits found near Station Number 11+97 and 15+25 were located in this filled area.

In addition to the documentary evidence, certain soil characteristics also suggested that this area had once been a shoreline. Well-sorted deposits of organic debris, sand, and clay are probably the result of wave action. Brick and stone rubble found in Excavation Unit 4, 5, A, and C (Strata L, I, C, and B, respectively) may represent an early attempt to stabilize the shoreline. This conclusion was documented in the historic record.

Excavation Units 6 and 7. Excavation Units 6 and 7 were located at Station Numbers 32+10 and 32+18, respectively, to find evidence of an unidentified structure shown on the 1888 map. This structure was identified as the target butt of the target range on a 1907 map (Figure 11) and as the rifle range on a 1912 map.

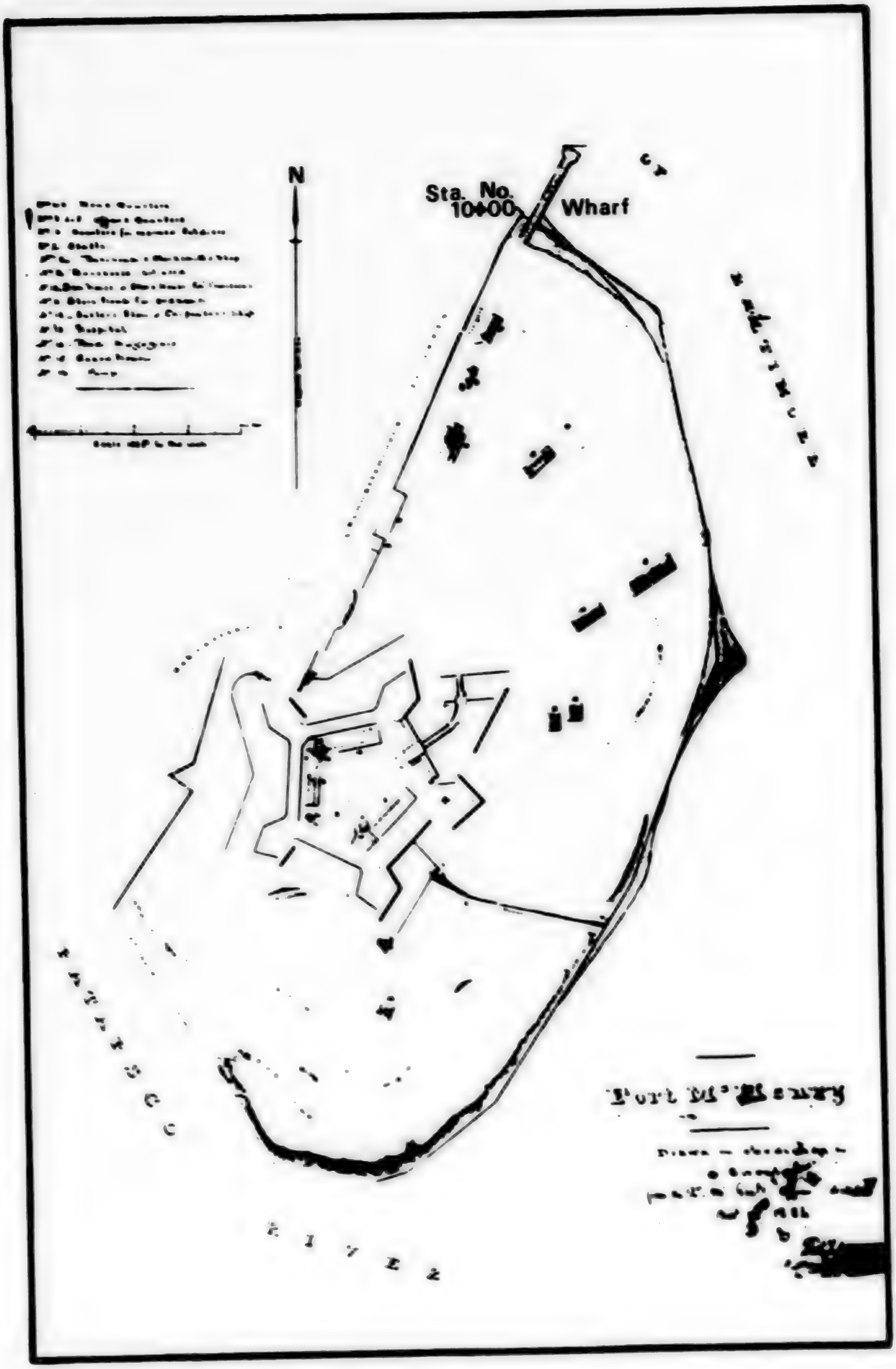

Figure 10. *1834 map, Fort McHenry (Brown 1985:81).*

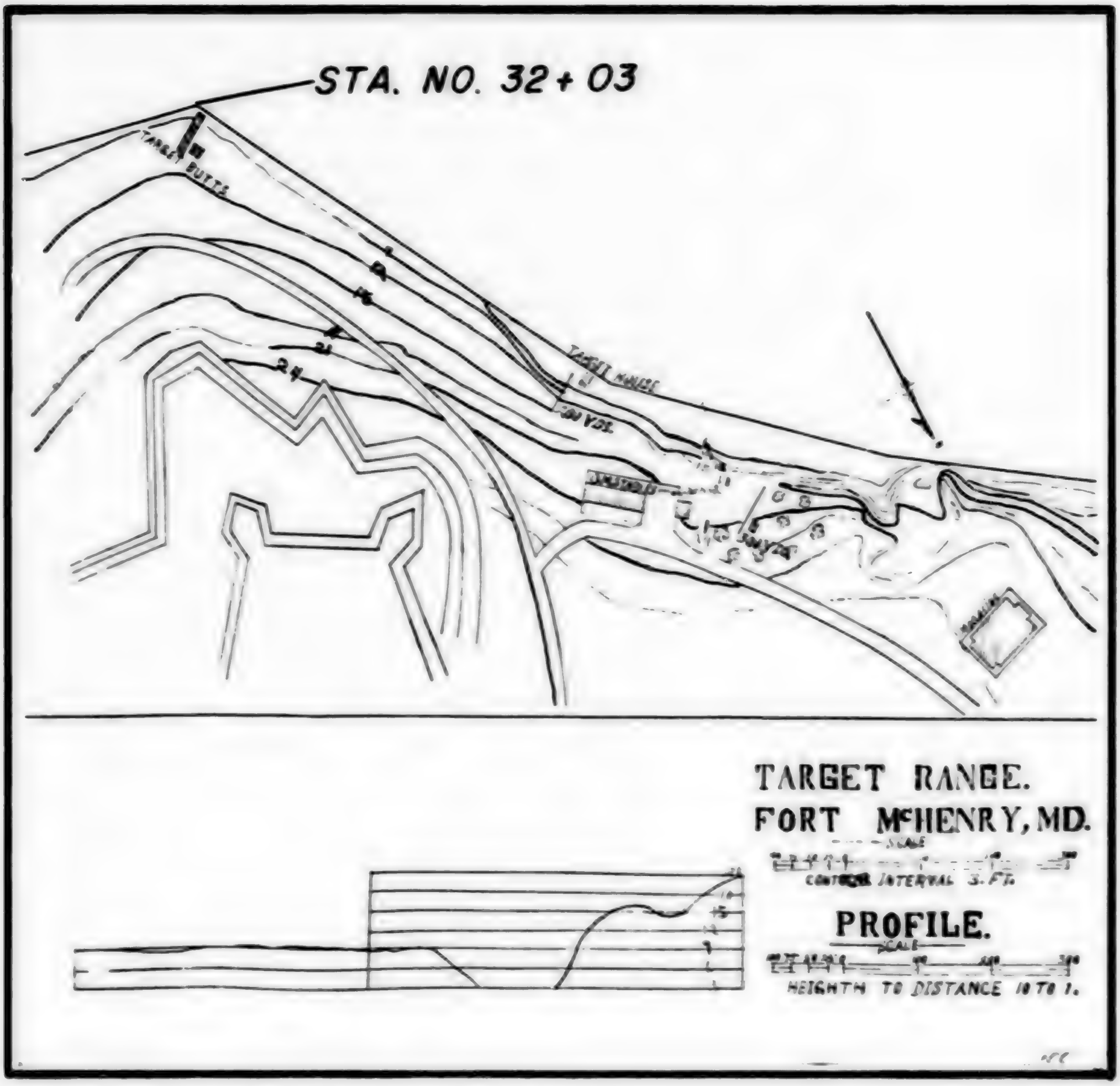

Figure 11. Target Range of Fort McHenry, c. 1907.

The location of this historically documented structure was verified in Excavation Units 6 and 7 (Figure 12). A masonry feature was uncovered in Excavation Unit 6, approximately 1.6 feet below the top of the capstones. The feature extended beyond the excavation unit and was, therefore, not completely exposed.

The exposed section of the target butt was composed of three large, cut granite stones. One large stone, measuring 1.5 feet wide by 3.5 feet long, showed evidence of quarrying. Three quarry marks were found on the top surface of the stone, along its eastern edge. This stone formed the western end of the target butt. An adjacent section of the target butt was composed of two large stones that were mortared in places. This structure was only one course deep, but mortar found on the top surface of the two easternmost stones indicated that the structure was once taller.

Historic information on target butts suggested that in populated areas they were generally 20 feet high (Bouslog, Appendix B). At Fort McHenry this height would have prevented most bullets from entering the busy shipping lane. According to the historic documents, the targets themselves were placed 20-30 feet in front of the butt, with scorekeepers pits in front of or off to the side of the targets.

A total of 563 bullets and lead fragments were recovered from these units. In Excavation Unit 6, 12 carbine bullets, 21 rifle bullets, 8 untyped bullets, 5 percussion caps, 2 cartridge fragments, and 17 lead fragments were found. In Excavation Unit 7, excluding those artifacts found in Feature 1, 9 carbine bullets, 27 rifle bullets, 8 untyped bullets, 3 carbine or rifle bullets, 21 percussion caps, 8 cartridge fragments, and 60 lead fragments were found. Bouslog conducted an experiment to identify the target material used at Fort McHenry by comparing the bullets found in Excavation Units 6 and 7 with bullets fired into a variety of materials. This experiment is discussed in Appendix B.

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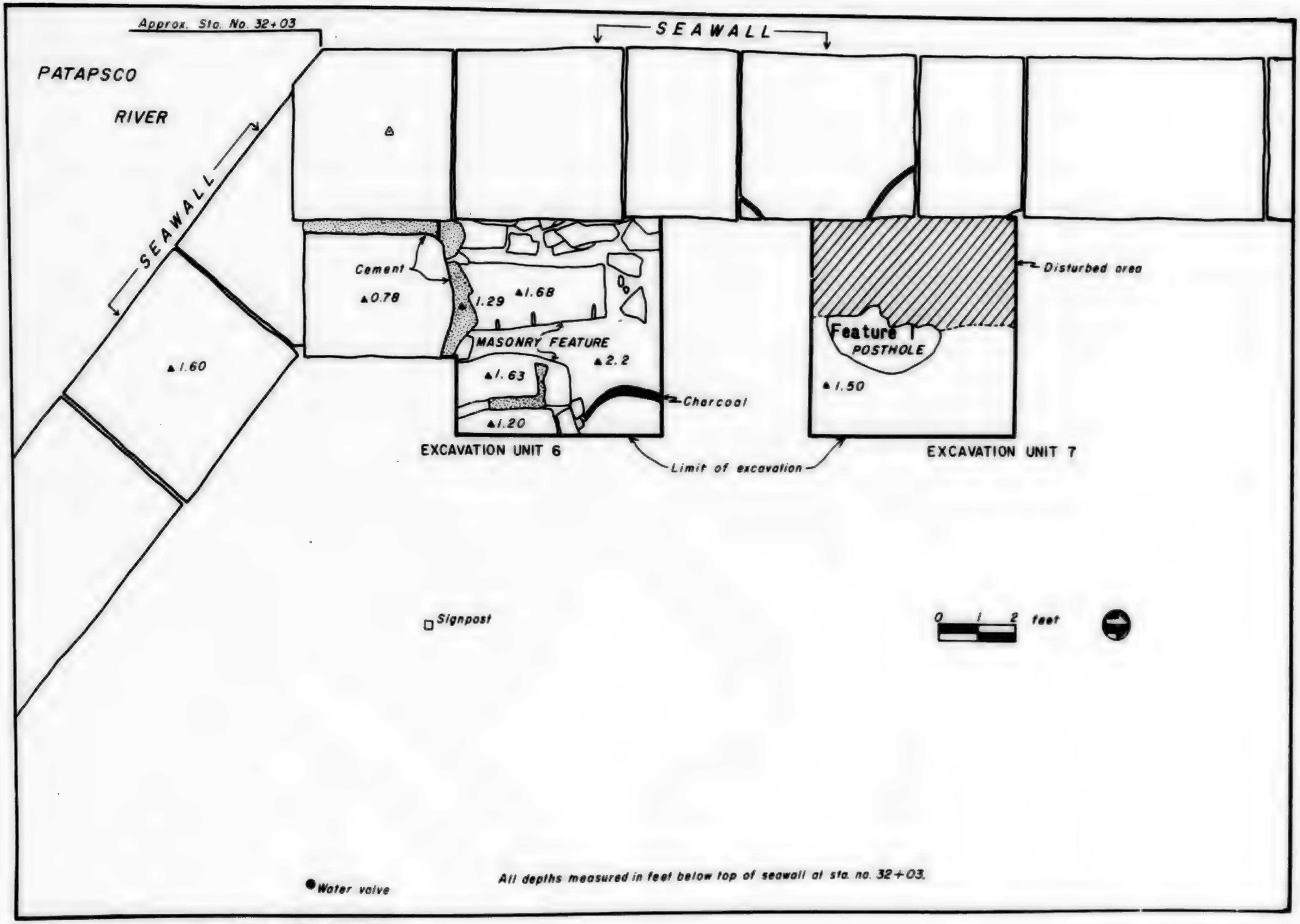

Figure 12. Excavation Units 6 and 7, plan view.

Besides physical evidence of the target butt, evidence of a target support, was also recovered. Feature 1, in Excavation Unit 7, was a posthole located 1.6 feet below the top of the capstones. Although this posthole contained many wood fragments, no post mold could be distinguished. The post was located 6 feet north of the target butt uncovered in Excavation Unit 6. This posthole may have been one of the posts or supports for a target. Although targets were usually placed 20-30 feet in front of the target butts, space or safety considerations may have necessitated the placement of the targets closer to the target butts.

If this feature was a support for a target, it might explain the high density of lead fragments found in the feature. Feature 1 contained 383 lead fragments, 10 bullet fragments, 3 rifle bullets, 1 untyped bullet, 1 minie ball, 36 cartridge fragments, and 2 percussion caps. Lead fragments from the bullets probably pierced the target post, and as it decayed these fragments then concentrated in the posthole.

A total of 560 artifacts were recovered from these units (Table 4). Additional evidence of a target structure was indicated by the high percentage of architectural artifacts found in these units. Artifacts from this group accounted for over 38 percent of the assemblage, the highest percent of any artifact group. As expected, Excavation Units 6 and 7 contained the highest percentage of arms artifacts of all the excavation units. The arms group comprised over 19 percent of the total artifact assemblage.

The artifactual data and the stratigraphic location of the target butt and the posthole indicated that they were contemporaneous. The strata above these features had been disturbed in both units. Mortaring can be seen between the seawall stones to a depth of 1.5 feet below the top of the capstones. Both of the features were found 1.6 feet below the top of the capstones, indicating that this may have been original grade in the late 19th-early 20th centuries.

Machine Tests

During September, 1986 a systematic series of backhoe trenches was excavated to test for features not noted in the historic record. Additionally, shovel test pits were excavated on each side of the seawall trail near Backhoe Trench 14 to examine the nature of the sidewalk, and to determine if it could withstand the heavy machinery traffic that will be used during the planned seawall rehabilitation.

No significant cultural resources were discovered in Trenches 2 through 13 and Trenches 15 through 19, although architectural details of the seawall were uncovered in each test (Figure 13). The base of the seawall could not be reached in any trench because of safety considerations and the height of the water table.

An extensive oyster shell deposit was also found during Phase II testing. Including those oyster shells found in Excavation Units 2 through 5, this deposit probably extends, at least, from Station Numbers 10+97 to 20+84. These shells caused very unstable sidewalls in both the hand- and machine-excavated units. On the average, these shells can be found between 1.6 feet and 2.9 feet below ground surface.

Between Station Numbers 32+39 and 34+58 several very hard cement piers were encountered that could not be removed by the backhoe (Figure 14). These piers were spaced at a 3-foot interval and are probably 20th century structures. They may be associated with General Hospital No. 2, and are not historically significant.

A possible granite rubble foundation was uncovered in Backhoe Trench 14 at Station Number 17+48 (Figure 15). This feature was found under the oyster shell deposit and on top of a dark yellowish brown silty clay.

During mitigation, a large area (Backhoe Trench 20) was opened in an effort to expose the entire feature. Backhoe Trench 20, measuring 5.5 feet wide and 32 feet long, was excavated parallel to the seawall between

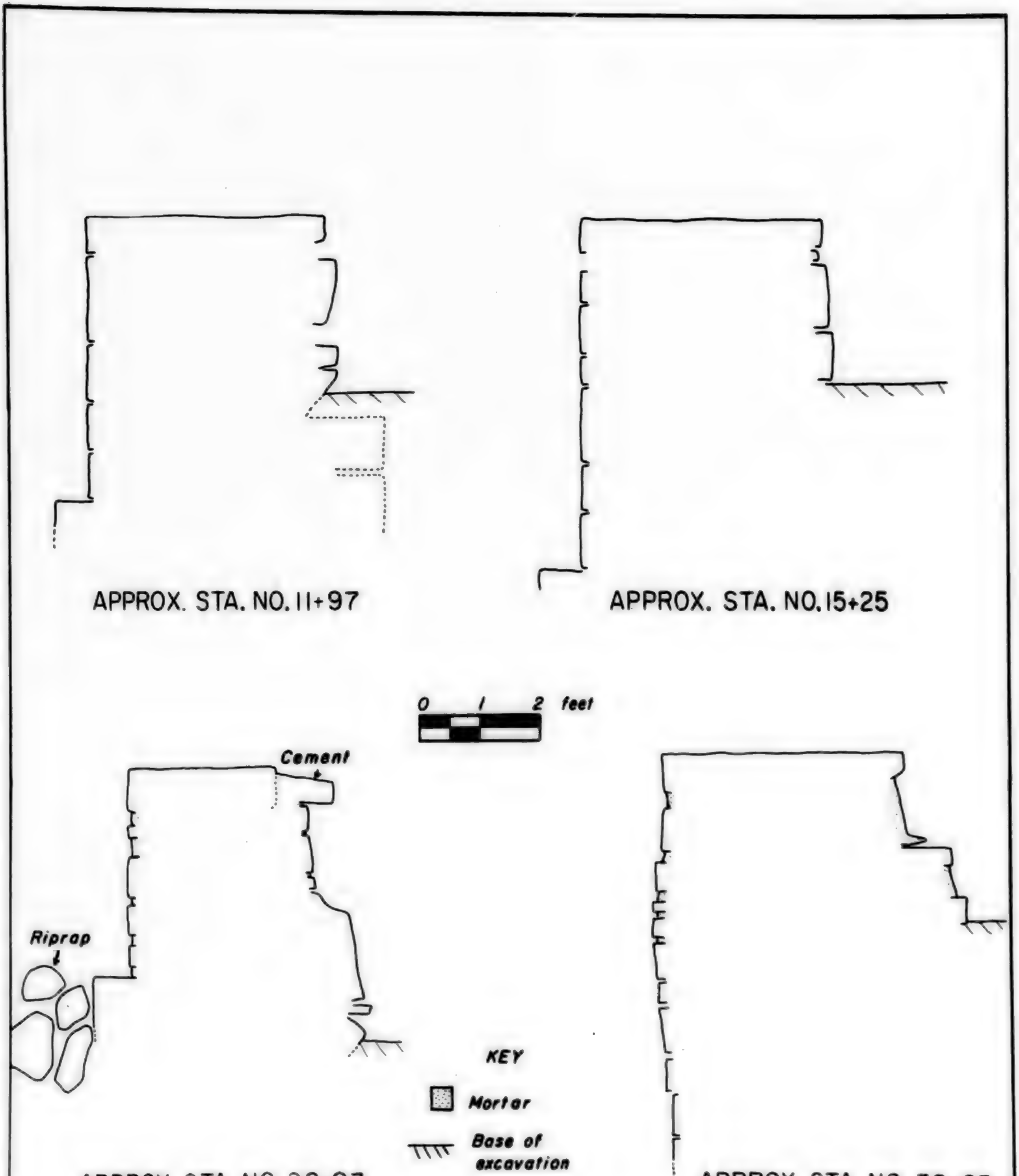

Figure 13. Seawall cross-sections, Fort McHenry National Monument and Historic Shrine.

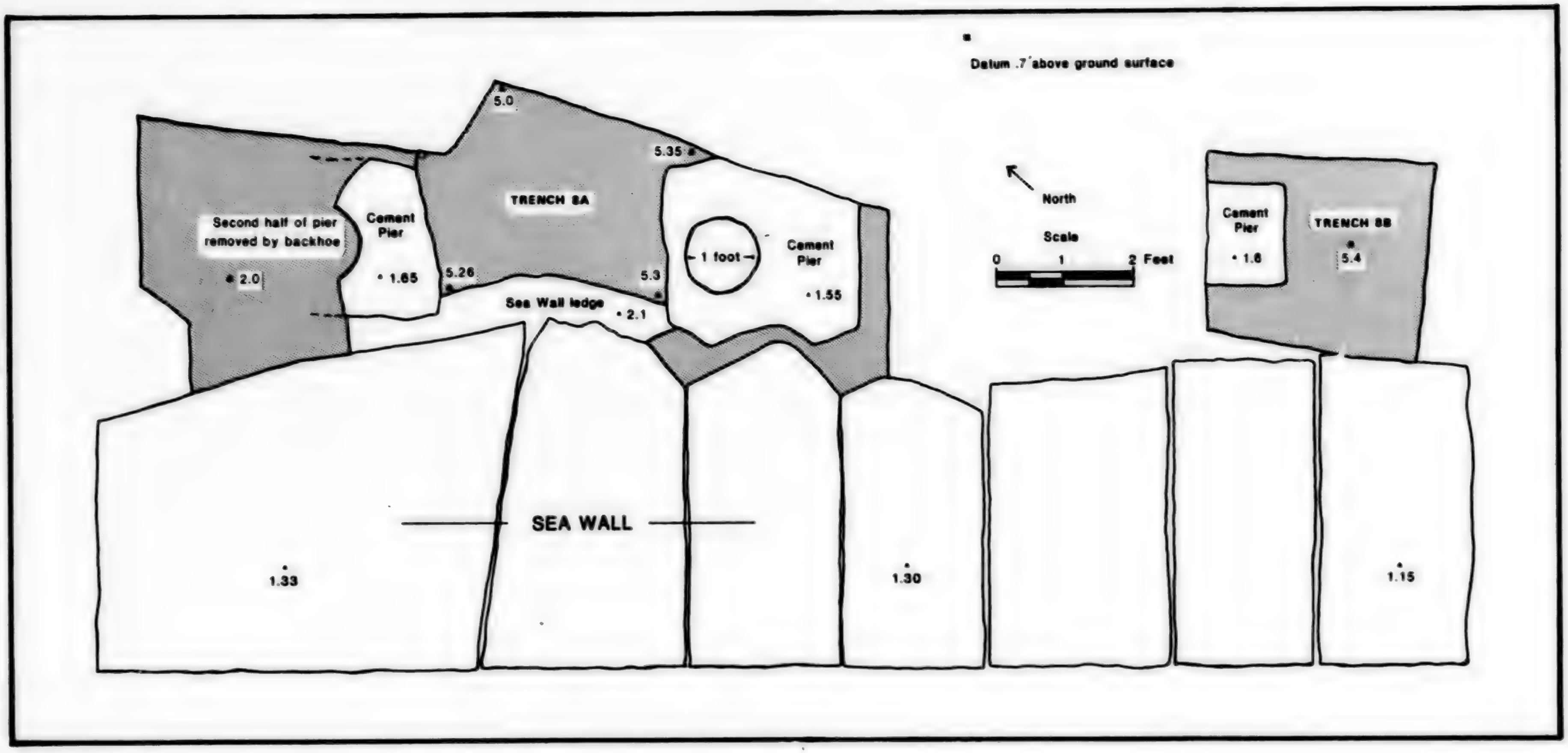

Figure 14. Backhoe Trenches 8A and 8B, plan view. Approximate station number 32+39.

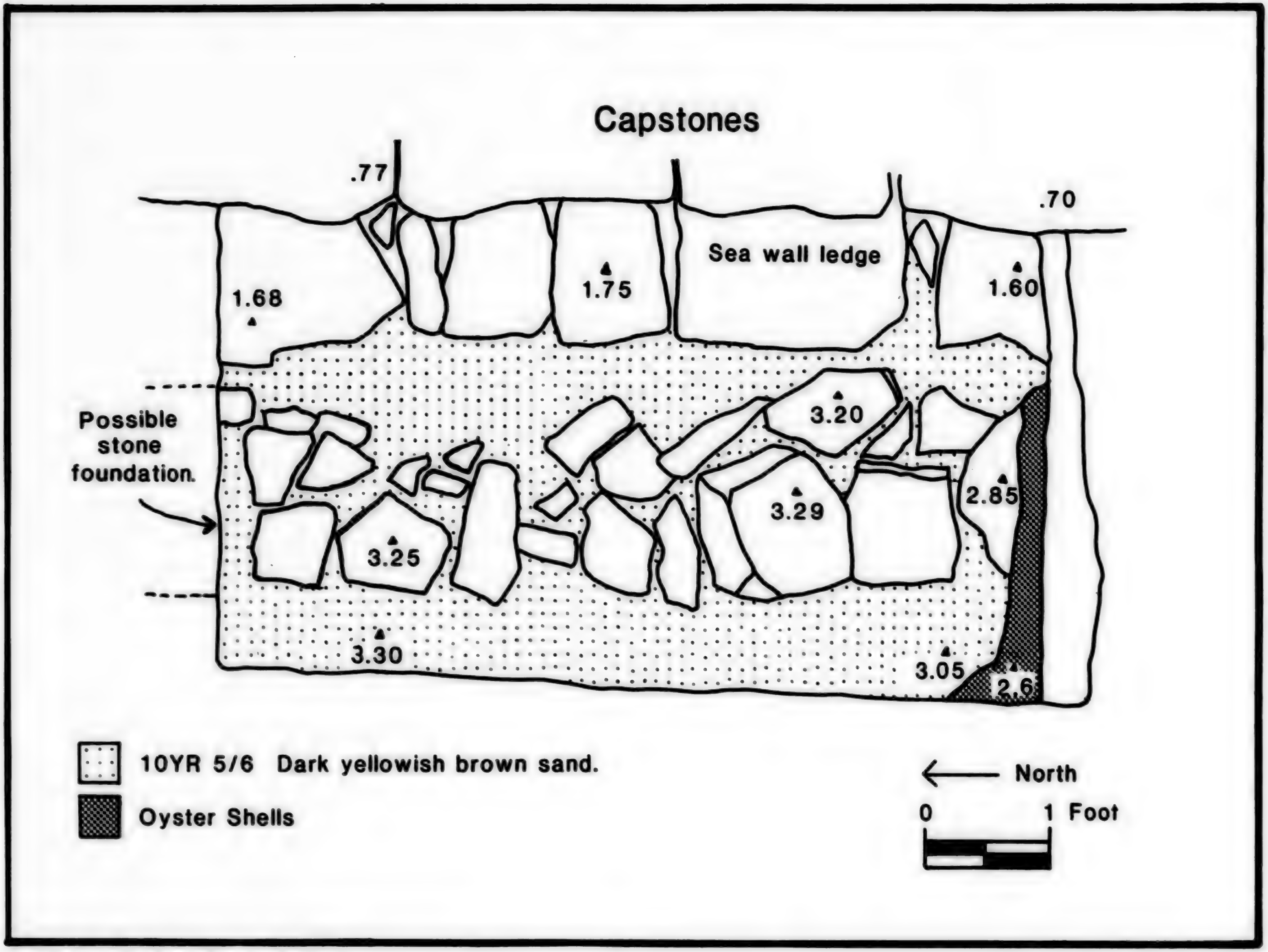

Figure 15. Backhoe Trench 14, plan view.

Station Numbers 17+40 and 17+72. This excavation revealed that the feature was not a foundation, but was rather a subsection or foundation of the seawall. It extended an undetermined distance beyond the limits of Mitigation Area 2.

The early 19th century refuse deposit uncovered near Station Number 15+25 (Excavation Units 4, 5, A, B, and C) was also present in Backhoe Trench 20, in Strata G and H. These strata were found under the oyster shell deposit (Stratum F) and were 10YR 4/4 dark yellowish brown sandy loam and 10YR 5/6 yellowish brown silty loam with brick and mortar fragments, respectively. Artifacts from these strata included creamware, undecorated and transfer-printed whiteware, refined redware, white clay pipestem fragments, bottle and window glass, unidentified nails and butchered and unmodified bones. A copper alloy military button was also recovered. According to Albert (1976:51), this button is from the 2nd Regiment, Artillery and dates to 1813-14.

CONCLUSION AND RECOMMENDATIONS

Ten excavation units and 20 backhoe trenches were excavated during the 1986 and 1987 investigations. Archeological and architectural data were recovered from each test. Cross-sections of the seawall and soil profiles will provide information for the seawall rehabilitation. The base of the seawall could not be reached in any test.

Excavation Units 2 and 3, located near Station Number 11+97, contained an early 19th century refuse deposit. The relatively high percentages of kitchen artifacts and bone recovered suggest that this assemblage represents kitchen refuse deposited on the shoreline at Fort McHenry.

Excavation Units 4, 5, A, B, and C, and Backhoe Trench 20 also contained a refuse deposit dating to the early 19th century. A mean ceramic date of 1832 was calculated for this deposit. This deposit exists intermittently from Station Numbers 15+25 and 17+48, and possibly extends at least to the end of the construction area at Station Number 18+48.77. The deposit may represent the grade and shoreline during the early occupation of Fort McHenry, prior to construction of the seawall.

A historically documented structure, a target butt for the rifle range, was verified in Excavation Unit 6. A posthole (Feature 1), found in Excavation Unit 7, may have been the support for a target placed in front of the target butt. These structures were verified by the high percentages of architectural and arms artifacts in these units.

An extensive oyster shell deposit, was discovered during Phase I and II testing between (Station Numbers 10+97 to 20+84). This deposit is an important diagnostic feature. All strata found below this deposit were historic deposits.

Based on the results of the archeological investigation behind the seawall and further documentary research it appears that the present stone seawall is not the original seawall at Fort McHenry. The absence of counterforts or buttresses clearly shown on the 1819 map, a historic reference to an old "brick" seawall in front of the fort, and cartographic evidence suggest that the present seawall is not original, and that the old seawall is probably located under the seawall trail. Construction supervisors should be alerted to the possibility of encountering the old seawall if any further construction is planned for this area.

Clearance is recommended for the entire project area, with the exception of monitoring between Station Numbers 15+25 and 18+48.77. However, if archeological resources are discovered during construction in other locations, work should be suspended immediately and the project archeologist should be contacted. Archeological monitoring is required during construction between Station Numbers 15+25 and 18+48.77 (Figure 16). The significance of the resources between these two points and the possibility of work delays in this area should be made known to the contractor during the preconstruction meeting. Also, sufficient time should be allowed in the construction schedule to permit the monitoring archeologist to make artifact collections, field notes and drawings. These precautions, and close coordination between construction supervisor, contractor, and monitoring archeologist, will avoid delays and allow smooth completion of the project.

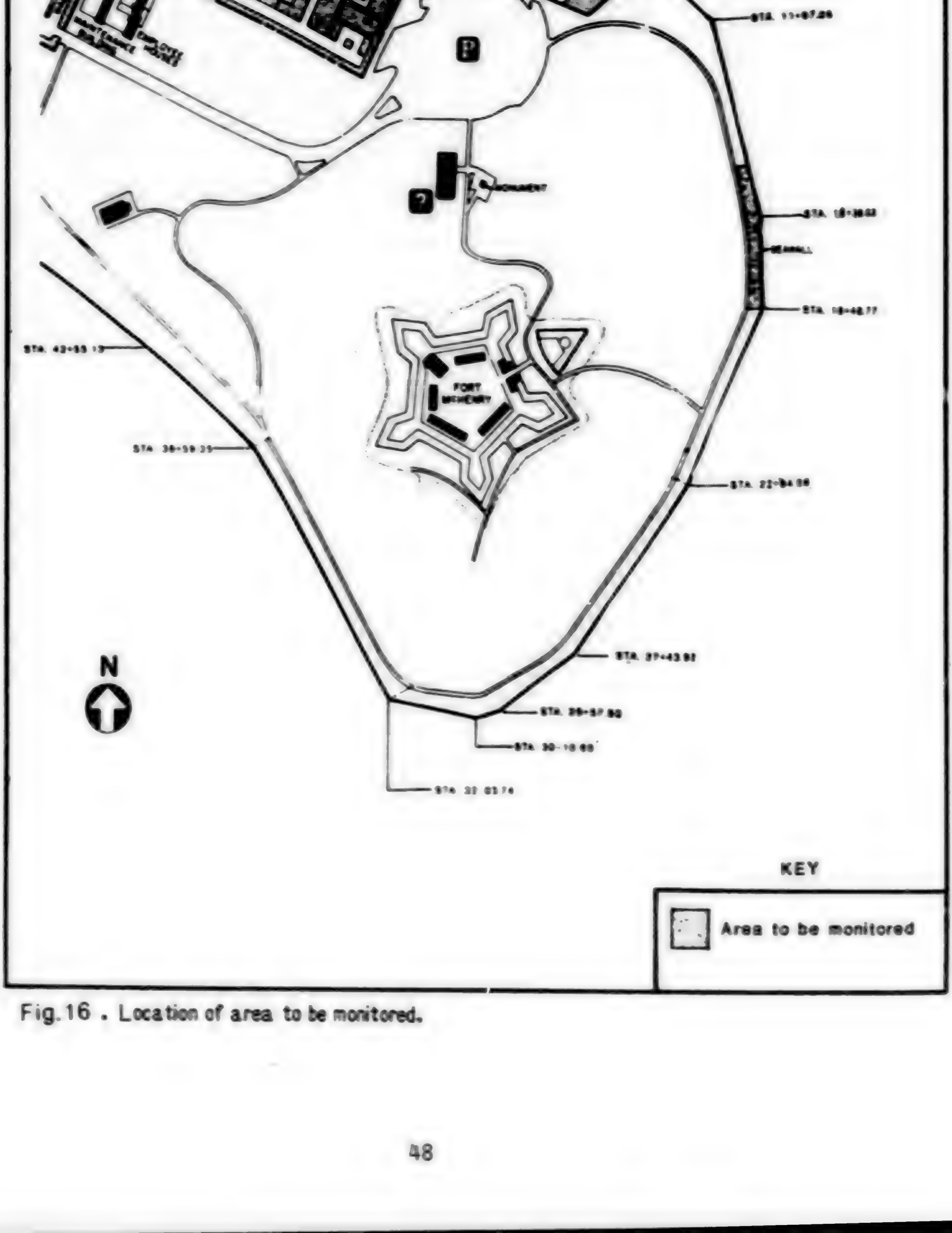

Fig.16 . Location of area to be monitored.

POSTSCRIPT

Monitoring was required between Station Numbers 15+25 and 18+48.77 to mitigate those resources found during the archeological excavations. Unfortunately, a communication breakdown between park officials, construction supervisors and DSC-TEA and American University archeologists resulted in construction along this area without a monitoring archeologist present. Construction activities did adversely effect the resource and some information was lost, since it was later learned that some wooden piers had been recovered within the project area. Unfortunately, these wooden piers were reburied/destroyed? before they were properly documents and their function remains undetermined.

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REFERENCES CITED

Aivazian, Brian L. et al.
1982 Archeological Investigations at Fort McHenry National Monument and Historic Shrine. National Park Service, Denver Service Center.

Albert, Alphaeus H.
1976 Record of American Uniform and Historical Buttons, Bicentennial Edition. Boyertown Publishing Company, Boyertown, Pennsylvania.

Bouslog, Heather H.
1987 "A Historical Background of Fort McHenry's Target Area." Unpublished paper on file at The American University, Department of Anthropology.

Brown, Sharon A.
1985 Historic Structure Report, Historic Data Section, Seawall, Fort McHenry, National Monument and Historic Shrine, Maryland. National Park Service, Denver Service Center.

Historic Maps
1819 Plan and Profile of Fort McHenry, by Captain William Tell Poussin. Map on file at the National Archives. Record Group 77, Drawer 51, Sheet 2.

1834 Plan of Fort McHenry. Map on file at the National Archives, Record Group 77, Drawer 51, Sheet 5.

1888 Plan of Fort McHenry, Maryland. Map on file at the National Archives, Record Group 77.

1907 Target Range, Fort McHenry, Maryland. Map on file at the National Archives, Record Group 77. Miscellaneous Forts File, Fort McHenry, Maryland. Series B, No. 100.

1912 Plan of Fort McHenry, Map on file at the National Archives. Record Group 77.

Joseph, J. W. and Charles D. Cheek
1985 Archeological Investigations of Drainage and Construction Features at Fort McHenry National Monument and Historic Shrine, Baltimore, Maryland. John Milner Associates.

Rutsch, Edward S.
1974 Archeological Investigation of the Original Systems of Fort McHenry National Monument and Historic Shrine, Baltimore, Maryland. National Park Service, Denver Service Center.

Stokinger, William, et al.
1981 Archeological Investigations, Fort McHenry National Monument and Historic Shrine, Maryland. Department of Anthropology, Brown University.

South, Stanley.
1977 Method and Theory in Historical Archeology. Academic Press, Inc., New York, New York.

Thompson, Edwin N. and Robert D. Newcomb.
1974 Historic Structure Report, Historical and Architectural Data Section, Fort McHenry National Monument and Historic Shrine, Maryland. National Park Service, Denver Service Center.

APPENDICES

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APPENDIX A
ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU1-A-1	1	1	1945 quarter
-2		1	wire nail
-3		2	glass lip
-4		1	hard paste porcelain, undec.
-5		1	window glass
-6		2	slag
-7		1	wire nail
EU1-B-1	2	1	slag
EU1-C-1	3	8	redware tile
-2		1	glass, body
-3		6	oyster shell
-4		4	slag
-5		2	window glass
-6		1	glass, body
-7		2	whiteware, body, undec.
-8		1	4-hole button, shell
-9		1	glass, body
-10		1	tile grout
-11		1	whiteware, body, undec.
-12		1	pipestem, 4/64", hand-rolled
-13		1	whiteware, rim
-14		4	unid. nail
-15		1	slate
-16		3	glass, body
EU1-C2-1	4	1	stoneware, salt-gl., handle
-2		1	buff-bodied ware, body
-3		2	redware roof tile
-4		1	glass, body
-5		1	slag
-6		1	milk glass
-7		1	glass, body
-8		2	redware, unglazed, body
-9	5	1	slag
-10		1	glass, body
-11		1	glass, body
-12		1	unid. nail
-13		1	glass, body
-14		1	slag

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU1-E-1	7	1	glass, body
-2		1	ball
-3		1	glass, body
-4	6	1	glass, body
-5		1	window glass
EU1-F-1	8	1	whiteware, body
-2	14	1	plastic washer
-3		1	lead-gl. earthenware
-4		1	styrofoam
-5		1	glass, body
-6		1	unid. nail
-7		1	arc torch carbon
EU2-A-1	9	1	plastic
-2		1	plastic
-3		1	plastic cap
-4		1	plastic bead
-5		1	plastic
-6		1	plastic
-7		1	plastic
-8		1	plastic
-9		1	plastic
-10		1	plastic
-11		1	rubber cap
-12		1	unid. nail
-13		1	window glass
-14		1	glass, body
-15		2	glass, body
-16		1	plastic cap
-17		1	glass, body
-18		1	plastic
-19		2	glass, body
-20		1	paper
-21		1	glass, body
-22		2	cigarette filters
-23		2	unmod. bone
-24		2	plastic
-25		2	glass, chimney
-26		1	glass, body
-27		2	cigarette filters
-28		1	weathered glass
-29		1	sewer pipe
-30		1	plastic
-31		1	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU2-2-1	10	1	hardpaste porcelain, body
-2		1	glass, body
-3		1	glass, base
-4		12	oyster shell
-5		2	wire nail
-6		4	soft paste porcelain, rim
-7		1	whiteware, rim
-8		1	whiteware, body, undec.
-9		2	glass, body
-10		1	2-hole button, shell, ellipse
-11		1	cut nail
-12		1	glass, chimney
-13		1	wire nail
-14		1	glass, stopper
-15		1	glass, body
-16		3	mortar
-17		1	glass, body
-18		1	glass, body
-19		1	glass, body
-20		1	glass, rim, tumbler
-21		1	glass, body
EU2-3-1	11	1	4-holed button, glass
-2		1	stoneware, salt-gl., body
-3		1	glass, base
-4		1	glass, body
-5		2	glass, body
-6		1	cinder
-7		1	glass, body
-8		1	glass, body
-9		1	glass, base
-10		1	wire, copper
-12		1	glass, body
-13		3	unid. nail
-14		1	wire, copper, cloth-covered
-15		11	unid. nail (wire?)
-16		1	spike (wire?)
-17		1	glass, shoulder
-18		1	glass, body
-19		2	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU2-4-1	12	2	bone (butchered?
-2		1	window glass
-3		1	lead carbine bullet
-4		1	slag
-5		1	pipestem, 7/64" bore
-6		1	styrofoam cup
-7		1	whiteware, body, undec.
-8		1	creamware, body, undec.
-9		1	concretion
-10		1	unid. nail
-11		1	cut nail
-12		14	concretions, iron?
-13		2	spike
-14		2	unid. metal
-15		1	animal tooth, cow or horse?
-16		4	cut nail
-17		1	handle, ferrous alloy?
-18		1	nail, cement, window glass
-19		1	metal strip, copper alloy
-20		1	animal tooth, cow or horse?
-21		3	bones, cut?
-22		1	plastic
-23		1	plastic cap
-24		1	plastic
EU2-5-1	13	1	plastic game peg
-2		1	plastic toy
-3		1	cigar mouthpiece, plastic
-4		1	cigarette filter
-5		1	plastic
-6		1	plastic
-7		1	plastic
-8		1	plastic
-9		1	plastic cap
-10		1	plastic cap
-11		11	plastic disk
-12		1	plastic
-13		1	plastic
-14		1	plastic
-15		1	styrofoam cup

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU2-5-16	13	1	styrofoam
-17		1	styrofoam
-18		2	cigarette filters
-19		1	plastic tube
-20		1	ceramic roof tile
-21		1	arc torch carbon
-22		2	red-bodied earthenware
-23		1	utility ceramic, body
-24		2	glass, body
-25		1	window glass
-26		1	glass, body
-27		1	glass, body
-28		3	unid. iron
-29		1	cannon friction primer, copper
-30		2	wire nail
-31		3	unid. nail
-32		2	cut nail
-33		1	cut nail, large
-34		1	copper tubing
-35		1	sheet iron
-36		4	unid. metal objects
-37		1	slag
EU2-6-1	14	1	plastic disk
-2		1	plastic ring
-3		1	unid. ceramic, body
-4		1	styrofoam
-5		1	glass, body
-6		1	unid. nail
-7		1	arc torch carbon
EU2-7-1	15	1	glass, base
-2		1	glass, body
-3		1	glass, body
-4		1	styrofoam
-5		1	styrofoam
-6		2	cut nail
-7		1	styrofoam
-8		1	creamware, body
-9		1	window glass
-10		1	ferrous alloy concretion
-11		1	glass, base
-12		3	styrofoam

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU2-7-13	15	1	styrofoam
-14		1	whiteware, rim
-15		2	bone
-16		2	plastic
-17		1	glass, body
-18		1	hard paste porcelain, body
-19		1	glass, body
-20		1	milk glass, body
-21		2	unid. nail
EU2-8-1	16	5	glass, body
-2		2	pearlware, rim, blue shell-ed.
-3		1	glass, body
-4		1	whiteware, body, undec.
-5		1	plastic disk
-6		4	styrofoam
EU2-9-1	17	1	window glass
-2		1	bone, unmodified
-3		2	glass, shoulder
EU3-A-1	18	9	unid. nail
-2		2	cement tile
-3		1	burnt stone
-4		3	metal concretion
-5		2	glass, body
-6		6	glass, body
-7		3	cigar mouthpieces
-8		4	glass, body
-9		2	window glass
-10		1	glass, body
-11		4	window glass
-12		1	plastic wrapper
-13		1	cigarette filter, plastic
-14		9	glass, body
-15		1	plastic
-16		4	glass, chimney
-17		1	plastic
-18		1	sandstone
-19		3	glass, body
-20		2	glass, body
-21		4	glass, body
-22		1	brick

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU3-A-23	18	1	glass, body
EU3-?-1	29	11	oyster shell sample
EU3-1-1	20	2	oyster shell sample
-2		1	brick
-3		1	cement tile
-4		1	quartz, ballast?
-5		5	glass, body
-6		1	glass, body
-7		3	glass, chimney
-8		1	unid. metal
-9		2	cut nail
-10		1	stoneware, s-gl., body
-11		1	glass, stopper
-12		1	glass, base
-13		10	glass, body
-14		10	glass, body
-15		1	glass, body
-16		8	window glass
-17		1	glass, shoulder
-18		8	glass, body
-19		3	glass, body
-20		3	wire? nail
-21		1	glass, body
EU3-2-1	21	1	styrofoam
-2		1	plastic bag
-3		1	oyster shell
-4		1	cement sample
-5		1	glass, body
-6		1	glass, body
-7		1	glass, body
-8		1	glass, body
-9		1	glass, body
-10		6	glass, body
-11		3	glass, body
-12		2	window glass
-13		5	glass, lip?
-14		3	glass, body
-15		2	pipestem, undec., 5/64" bore
-16		3	wire nail
-17		2	unid. iron concretion

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU3-2-18	21	1	nail/spike
-19		1	glass, body
EU3-3-1	22	2	glass, lip
-2		1	unid. nail
-3		1	glass, body
-4		1	hard paste porcelain, body
-5		2	wire nail
-6		3	pipestem, 7/64" bore
-7		1	redware, lead-glaze, body
-8		1	oyster shell with nail
-9		1	chert ballast
-10		1	glass, body
-11		2	styrofoam
-12		1	unid. metal
-13		1	stoneware, base, s-glaze
-14		2	glass, body
-15		1	window glass
-16		1	glass, body
-17		1	unid. metal
EU3-4-1	23	1	fossilized wood
-2		5	unid. metal
-3		1	earthenware, base, lead-gl.
-4		1	whiteware, rim, scalloped
-5		6	ferrous alloy concretions
-6		1	glass, body
-7		1	glass, body
-8		1	whiteware, body
-9		1	animal tooth
-10		2	quartz flakes, ballast
-11		12	unid. nail/concretion
-12		1	pearlware, rim
-13		1	cut nail
-14		1	bivalve shell
-15		1	quartz, ballast
-16		1	glass, body
-17		2	quartz, ballast
-18		1	redware, base
EU3-4-1	26	5	cut nail
-2		1	cut nail, copper alloy
-3		1	glass, lip

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU3-4-4	26	1	nail/spike
-5		2	window glass
-6		5	unid. nail
EU3-5-1	24	1	redware, body
-2		1	pipestem, 7/64" bore
-3		7	unid. metal concretions
EU3-7-1	27	1	oyster shell
-2		1	lead strip
-3		6	glass, body
-4		5	unid. iron object
-5		14	mortar
-6		10	bone, butchered
-7		1	glass, body
-8		3	slate
-9		1	glass, body
-10		1	unid. iron concretion
-11		1	glass, body
-12	25	5	plaster
-13		1	glass, body
-14		5	glass, body
-15		1	whiteware, body, transfer-pr.
-16		1	whiteware, body, transfer-pr.
-17		2	wire, copper alloy
-18		1	"elec. connector", copper al.
-19		2	unid. iron concretion
-20		8	window glass
-21	28	15	bone, unmodified
EU3-f1-1	19	2	iron concretions
-2		1	glass, body
-3		1	glass, body
-4		1	brick
-5		1	styrofoam
-6		1	glass, body
-7		1	glass, body
-8		1	glass, body
-9		1	cut nail
-10		1	glass, body
EU4-1-1	30	7	glass, body
-2		1	glass, lens
-3		3	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU4-1-4	30	2	window glass
-5		1	glass, body
-6		1	whiteware, body, undec.
-7		1	plastic
-8		1	plastic
-9		1	key ring
-10		2	wire nail
-11		1	bolt
-12		1	slag
EU4-2-1	31	10	glass, body
-2		1	creamware, body, undec.
-3		1	porcelain, body, undec.
-4		1	glass, body
-5		1	glass, body
-6		1	glass, body
-7		1	glass, lip/neck
-8		4	window glass
-9		1	glass, body
-10		1	wire nail
-11		1	cut nail
-12		2	unid. nail
-13		1	hollow core block
-14		1	slag
-15		1	wire, nail
EU4-3-1	32	3	cut nail
-2		2	wire nail
-3		1	unid. nail
-4		1	bolt
-5		1	window glass
-6		2	glass, body
-7		1	glass, body
-8		1	glass, body
EU4-4-1	33	2	whiteware, body, undec.
-2		1	whiteware, rim, annular
-3		1	glass, body
-4		1	plastic
-5		1	bone
EU4-5-1	41	1	plastic
-2		1	tile
-3		1	plastic

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU4-6-1	43	1	redware, body, lead-gl.
-2		1	creamware, body, undec.
-3		1	stoneware, body, salt-gl.
-4		2	glass, body
-5		5	window glass
-6		1	whiteware, base, transfer-pr.
-7		2	glass, base
-8		1	whiteware, rim, undec.
-9		2	unid. metal concretions
-10		2	mortar/plaster sample
-11		2	bone, butchered
-12		1	bone, weathered
-13		1	bone
EU4-6-1	42	2	glass, body
-2		5	bone, unmodified
-3		1	whiteware, rim, shell-edge
-4		1	porcelain, base, undec.
-5		1	redware, body, lead-gl.
-6		1	soft paste porcelain, body
-7		1	plastic
-8		1	creamware, body, undec.
-9		2	whiteware, base, undec.
-10		1	hard paste porcelain, body
-11		1	glass, body
-12		1	glass, body
-13		1	bone, sawn
-14		2	plastic
-15		1	glass, body
-16		1	glass, body
-17		2	brick
-18		1	plastic
-19		2	redware, body, teapot?
-20		3	whiteware, body
-21		1	plastic
-22		1	cigarette filter
-23		2	plaster
-24		14	unid. nail
-25		1	plastic cap
-26		2	styrofoam

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU4-6-27	42	1	plastic straw
-28		7	styrofoam cup
-29		4	bone, unmodified
-30		1	cigarette filter
-31		2	glass, body
EU5-A-1	34	1	plastic
-2		2	2-hole copper alloy button
-3		1	eraser
-4		1	wire nail
-5		1	oyster shell
EU5-1-1	35	1	whiteware, body, undec.
-2		1	window glass
-3		1	unid. metal object
-4		1	oyster shell
-5		2	wire nail
-6		1	wire nail
EU5-2-1	36	7	oyster shell
-2		1	hollow core block
-3		1	unid. earthenware, base
-4		1	unid. clay object
-5		2	glass, base
-6		3	glass, body
-7		1	glass, lip
-8		1	glass, body
-9		4	window glass
-10		6	wire nail
-11		3	unid. nail
-12		12	unid. iron object
EU5-3-1	37	1	hollow coree block
-2		1	drain pipe
-3		1	drain pipe
-4		1	whiteware, body, undec.
-5		1	whiteware, rim, undec.
-6		1	plaster sample
-7		5	window glass
-8		3	flat glass
-9		1	glass, body
-10		2	glass, body
-11		2	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU5-3-12	37	1	glass, body
-13		1	glass, body
-14		2	cut nail
-15		6	wire nail
-16		2	unid. nail
-17		6	wire
-18		2	unid. iron objects
-19		2	unid. bone artifact
EU5-4-1	38	1	sewer pipe
-2		1	glass, body
-3		1	plastic
-4		2	unid. nail
-5		1	unid. nail/spike
EU5-5-1	39	4	styrofoam
-2		1	styrofoam
-3		1	ball-point pen cap
-4		1	plastic cap
-5		1	foil/plastic wrapper, "Fizzie"
-6		1	brick
-7		11	window glass
-8		2	window glass
-9		1	window glass
-10		1	glass, body
-11		2	glass, body
-12		1	glass, lip
-13		1	redware, body, lead-gl.
-14		4	creamware, body, undec.
-15		1	creamware, rim, undec.
-16		3	whiteware, body, undec.
-17		3	pearlware, body, undec.
-18		1	pearlware, body, painted
-19		1	pearlware, body, annular
-20		1	pipestem
-21		1	cut nail
-22		2	wire nail
-23		9	unid. nail
-24		3	unid. metal object
-25		2	plaster/mortar sample
-26		3	unid. bone artifact

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU5-5-27	39	9	bone, broken
-28		1	bone, burned
EU5-6-1	40		unid. nail
-2		25	bone, unmodified
-3		2	hard paste porcelain, body
-4		13	creamware, body, undec.
-5		1	stoneware, salt-gl.
-6		10	whiteware, body, undec.
-7		1	pearlware, body, dec.
-8		1	whiteware, base, undec.
-9		1	slate
-10		24	window glass
-11		1	glass, shoulder
-12		1	brick
-13		1	glass, body
-14		1	whiteware, body, transfer-pr.
-15		2	whiteware, rim, dec.
-16		1	stoneware, body, salt-gl. ext.
-17		2	redware, body, lead-gl. int.
-18		1	plastic handle
-19		1	styrofoam
-20		1	whiteware, rim, dec.
-21		1	glass, body
-22		1	redware, body, lead-gl. int.
-23		1	pipebowl, fluted
-24		1	plastic
-25		1	plaster/mortar sample
-26		1	utilitarian ceramic, unglazed
-27		1	glass, body
-28		1	plastic
-29		1	hard paste porcelain, body
-30		1	whiteware, rim, transfer-pr.
-31		2	whiteware, body, transfer-pr.
-32		1	buff-bodied ware, body
-33		1	plastic
-34		1	styrofoam
-35		1	glass, body
-36		1	flat glass
-37		2	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU5-6-38	40	1	glass, body
-39		1	chert, ballast
-40		1	glass, body
-41		4	glass, body
EU5-7-1	44	1	Rockingham/Bennington, body
-2		21	whiteware, body, dec.
-3		1	whiteware, body, transfer-pr.
-4		3	pearlware, body, dec.
-5		1	pearlware, body, annular
-6		1	pearlware, base, undec.
-7		10	glass, body
-8		1	glass, body
-9		1	glazed brick
-10		3	slate
-11		1	whiteware, body, dec.
-12		2	whiteware, handle, trans-pr.
-13		1	whiteware, rim, shell-edge
-14		1	whiteware, body, transfer-pr.
-15		1	redware, body, lead-gl.
-16		1	redware, body, lead-gl.
-17		1	pipebowl, floral pattern
-18		1	redware, body, lead-gl.
-19		1	redware, body, lead-gl. int.
-20		1	pipestem, 5/64" bore
-21		1	buff-bodied, body, lead-gl.
-22		1	bullet, .43 cal.
-23		1	whiteware, body, transfer-pr.
-24		1	stoneware, body, salt-gl.
-25		1	whiteware, body, dec.
-26		1	whiteware, body, dec.
-27		1	whiteware, base
-28		1	whiteware, handle, dec.
-29		1	whiteware, body, transfer-pr.
-30		1	whiteware, rim, shell-edge
-31		1	soft paste porcelain, body
-32		3	mortar/plaster
-33		1	hard paste porcelain marble
-34		1	shell, unmodified
-35		1	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU5-7-36	44	2	glass, body
-37		1	glass, body
-38		14	window glass
-39		1	glass, rim
-40			
-41		1	glass, body
-42		1	window glass
-43		1	unid. nail
-44		1	cut nail
-45		2	creamware, body, undec.
-46		1	soft paste porcelain, body
-47		5	whiteware, body, undec.
-48		7	pearlware, body, undec.
-49		4	copper plate/sheet
-50		14	bone, burned/broken
-51		5	bone, sawn
-52		5	unid. iron objects
-53		15	bone, broken
-54		1	copper alloy strip
-55		9	unid. nail
-56		4	tile
-57		1	military button (1814-1821)
EU5-stp-1	45	1	oyster shell
-2		2	unid. burned object
-3		4	whiteware, body, undec.
-4		1	whiteware, rim, transfer-pr.
-5		1	whiteware, body, transfer-pr.
-6		2	whiteware, base, undec.
-7		2	creamware, body, undec.
-8		1	creamware, rim, undec.
-9		3	porcelain, body, undec.
-10		1	redware, body, annular
-11		1	stoneware, body, salt-gl.
-12		1	red-bodied, body, lead-gl.
-13		2	red-bodied, body, Albany slip
-14		1	redware, rim/handle
-15		1	redware, rim/lip
-16		1	earthenware, body, burned

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU5-stp-17	45	1	pipestem
-18		1	roofing tile
-19		1	pearlware, body, undec.
-20		2	glass, body
-21		1	glass, lip
-22		1	window glass
-23		1	glass, body
-24		1	glass, body
-25		6	bone, broken
-26		2	bone, cut/sawn
-27		8	bone, burned
-28		5	cut? nail
-29		3	unid. iron concretion
-30		1	wood charcoal
EU6-1-1	46	1	plastic
-2		1	plastic handle
-3		1	plastic
-4		1	plastic
-5		1	plastic
-6		1	plastic
-7		1	plastic
-8		1	plastic
-9		1	plastic
-10		1	plastic
-11		1	plastic
-12		1	aerosol button
-13		1	bottle cap liner
-14		1	plastic
-15		1	barrette
-16		1	cigar mouthpiece
-17		1	plastic cap
-18		1	plastic pen
-19		1	plastic pen cap
-20		1	plastic pen cap
-21		1	plastic
-22		1	plastic
-23		1	plastic washer
-24		1	plastic

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-1-25	46	1	tape core
-26		1	plastic
-27		1	plastic
-28		1	plastic
-29		1	plastic soldier
-30		2	plastic
-31		1	styrofoam
-32		1	styrofoam
-33		2	plastic
-34		1	masking tape
-35		4	cigar mouthpieces
-36		1	plastic
-37		2	cigarette filter
-38		1	plastic cap
-39		1	hexagonal nut
-40		1	tennis ball
-41		1	plastic
-42		1	glass, body
-43		4	unid. metal
-44		1	glass, body
-45		2	glass, body
-46		1	wire nail
-47		4	glass, body
-48		1	mortar
-49		1	charcoal
-50		1	glass, rim, tumbler
-51		1	quartz, ballast
-52		11	cut nail
-53		1	synthetic rubber, caulking
-54		1	wire nail
-55		1	slag
-56		4	whiteware, base
-57		1	glass, body
-58		1	wire nail
-59		1	bullet, .30-06 Springfield?
-60		1	glass, bottleneck
-61		1	ceramic tile
-62		3	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-1-63	46	2	glass, body
-64		1	pencil lead
-65		1	plastic
-66		1	plastic
-67		1	concrete tile
EU6-2-1	47	1	plastic
-2		1	plastic
-3		1	plastic
-4		1	cigar mouthpiece
-5		1	cigarette filter
-6		1	plastic
-7		1	plastic
-8		1	plastic
-9		1	plastic toy
-10		8	wire nail
-11		1	cut nail
-12		1	screw
-13		1	pebble
-14		2	slag
-15		3	styrofoam
-16		1	styrofoam
-17		1	concrete tile
-18		1	copper alloy strap
-19		3	glass, body
-20		1	bullet, rifle, .45 cal
-21		3	glass, body
-22		1	ironstone, body, dec.
-23			glass, body
-24		2	bullet, rifle, 3-ring
-25		1	plastic cap
EU6-2-1		1	chert, ballast
-2		1	unid. nail
-3		1	bullet, rifle, 3-ring
-4		1	1863 Indian head cent
-5		1	1862 Indian head cent
-6		1	glass, body
EU6-3-1	48	1	glass, rim
-2		1	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-3-3	48	1	cane tip, black rubber
-4		1	glass, unidentified
-5		1	glass, body
-6		1	plastic
-7		62	nails, unid.
-8		1	glass, body
-9		3	glass, body
-10		1	window glass
-11		1	glass, rim
-12		2	window glass
-13		1	slag
-14		5	cut nail
-15		5	lead frag.
-16		1	glass, shoulder
-17		2	glass, body
-18		1	glass, body
-19		1	glass, body
-20		2	plastic
-21		1	glass, base
-22		3	tile
-23		5	burnt wood
-24		9	glass, body
-25		1	glass, body
-26		1	cut nail
-27		1	glass, body
-28		1	glass, unid.
-29		2	glass, body
-30		1	slotted screw
-31		1	cut nail
-32		1	bolt or nail
-33		1	machine part
-34		1	plastic
-35		1	whiteware, body, undec.
-36		1	glass, body
-37		4	glass, body
-38		1	wire sprig
-39		5	bark
-40		1	glass, body
-41		1	wire nail
-42		1	crown cap
-43		1	small bone, unmodified
-44		1	bone, unid., unmodified

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-3-45	48	1	slag with metal frag
-46		1	plastic
-47		3	styrofoam
-48		1	slate
-49		1	bone, unid.
-50		1	plastic
-51		1	styrofoam
-52		2	plastic
-53		3	bone, broken
-54		1	fastener, copper alloy
-55		2	percussion cap
-56		1	percussion cap
-57		1	nickel, 192?
-58		1	lead pellet, buck shot
-59		1	military button, copper alloy
-60		1	unid. copper object
-61		1	rifle bullet, .44 cal.
-62		1	bullet, unid.
-63		1	rifle bullet, ringed
-64		3	unid. tubular object, copper
-65		1	carbine bullet, .45 cal.
-66		1	carbine bullet, .43 cal.
-67		1	unid. bullet/cartridge
-68		11	rifle bullets, 3-ringed
-69		5	carbine bullets, 3-ringed
-70		1	cartridge, .44 cal.
-71		1	cartridge, .28 cal.
-72		1	bullet, pointed
-73		1	bullet, rounded tip
-74		1	rifle bullet, .415 cal.
EU6-3-1	49	1	bone, unmodified
-2		3	styrofoam
-3		1	window glass
-4		1	plastic
-5		3	glass, body
-6		1	plastic
-7		1	carbine bullet
-8		1	plastic
-9		1	glass, chimney
-10		2	plastic
-11		4	metal, unid.
-12		1	styrofoam

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-3-13	49	1	lead frag.
-14		1	pipestem, mouthpiece, 5/64"
-15		1	glass, body
-16		1	mortar/plaster
-17		1	metal wire
-18		1	bullet, unid.
-19		1	unid. metal object
-20		1	furniture finial?
EU6-4-1	50	1	container lid
-2		17	unid. metal
-3		21	unid nail
-4		13	bone, unmodified
-5		1	rifle bullet, .40-.45 cal.?
-6		8	lead frag.
-7		1	whiteware, body, dec.
-8		1	plastic
-9		1	plastic
-10		1	cigarette filter
-11		2	styrofoam
-12		1	plastic
-13		1	styrofoam
-14		1	glass, body
-15		1	glass, body
-16		1	glass, body
-17		1	plastic
-18		1	plastic
-19		1	glass, rim
-20		2	glass, body
-21		5	chert ballast
-22		1	percussion cap
-23		1	plastic
-24		1	rifle bullet, .44 cal.
-25		1	carbine bullet, .44 cal.
-26		1	carbine bullet, .44 cal.
-27		1	carbine bullet, .45 cal.
-28		1	cement/mortar
-29		1	paper
EU6-4-1	51	12	unid. nail
-2		15	bone, weathered
-3		1	carbine bullet, .45 cal.

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU6-4-4	51	1	percussion cap
-5		1	concrete/mortar
-6		5	unid. iron
-7		2	lead frag.
-8		1	brick/mortar
EU6-st6-1	54	1	bullet, unid.
EU6-ws-1	53	1	rifle bullet, 3-ringed
-2		1	wire nail
-3		1	lead frag.
-4		1	plastic
-5		2	cut nail
-6		2	unid. nail
-7		1	plastic
-8		1	unid. metal
EU7-1-1	55	1	plastic
-2		1	plastic
-3		1	plastic
-4		1	plastic
-5		1	plastic
-6		1	plastic
-7		1	plastic
-8		1	plastic
-9		1	plastic
-10		1	plastic
-11		1	plastic
-12		1	plastic
-13		1	plastic
-14		1	plastic
-15		1	plastic
-16		1	plastic
-17		1	plastic
-18		1	plastic
-19		1	plastic
-20		1	plastic
-21		1	plastic
-22		1	plastic
-23		1	plastic
-24		1	plastic
-25		1	plastic
-26		1	plastic

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
CU7-1-27	55	1	plastic
-28		1	plastic
-29		1	plastic
-30		1	plastic
-31		1	plastic
-32		1	plastic
-33		1	plastic
-34		1	plastic
-35		1	plastic
-36		1	plastic
-37		1	plastic
-38		1	plastic
-39		1	plastic
-40		1	plastic
-41		1	ironstone, rim, undec.
-42		3	glass, body/rim
-43		3	styrofoam
-44		1	plastic
-45		27	glass, body
-46		1	plastic
-47		2	glass, body
-48		1	plastic
-49		4	flotation beads/slag
-50		1	unid. metal
-51		1	cut nail
-52		1	glass, base
-53		1	redware, rim, "flowerpot"
-54		1	whiteware, body, dec.
-55		10	glass, body
-56		3	plastic
-57		1	plastic
-58		1	plastic
-59		1	metal plate
-60		2	glass, body
-61		1	glass, body
-62		1	plastic
-63		1	hard paste porcelain, rim
-64		3	slag
-65		1	glass, rim, threaded
-66		1	plastic

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-1-67	55	3	window glass
-68		1	glass, body
-69		1	plastic
-70		1	glass, lid
-71		1	unid. material
-72		4	glass, body
-73		1	wire nail
-74		1	whiteware, rim, dec.
-75		1	plastic
-76		3	plastic
-77		1	plastic
-78		1	plastic
-79		5	metal
-80		1	cut nail
-81		2	plastic
-82		7	unid. metal
-83		1	cut nail
-84		1	plastic
-85		1	unid. metal
-86		6	unid. nail
-87		2	ironstone, body
-88		2	window glass
-89		1	carbine bullet, .45 cal.
-90		1	glass, base
-91		1	cut nail
-92		1	plastic
-93		1	whiteware, body, undec.
-94		1	brick
-95		1	bone, broken
-96		5	plastic
-97		1	plastic
-98		1	glass, body
-99		1	lead sinker
-100		2	glass, body
-101		4	cut nail
-102		1	whiteware, base, undec.
-103		2	styrofoam
-104		1	plastic
EU7-2-1	56	2	glass, body
-2		1	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-2-3	56	1	glass, body
-4		1	glass, body
-5		1	plastic
-6		4	glass, body
-7		3	wire nail
-8		34	unid. nail
-9		5	cut nail
-10		7	glass, body, thin
-11		5	glass, body
-12		2	glass, body
-13		3	tile
-14		24	slag
-15		13	window glass
-16		2	glass, body
-17		5	glass, body
-18		1	wire frag., copper alloy
-19		2	shell, unid., unmodified
-20		2	bone, unmodified
-21		1	chert ballast
-22		1	whiteware, body, undec.
-23		1	lead frag.
-24		1	plastic
-25		1	pipestem, 5/64" bore
-26		1	wire nail
-27		3	rifle bullet, .45 cal.
-28		1	rifle musket bullet, .577 cal.
-29		1	carbine bullet, 3-ringed
-30		1	carbine bullet?, 3-ringed
-31		1	cartridge, .25 Stevens
EU7-3-1	57	2	cartridge frag.
-2		2	glass, body
-3		1	pearlware, body, dec.
-4		1	chert ballast
-5		1	lead frag.
-6		2	rifle bullet, .45 cal.
-7		6	slag
-8		3	carbine or rifle bullet?
-9		1	glass, body
-10		3	window glass
-11		2	glass, body

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-3-12	57	1	glass, base
-13		1	glass, body
-14		1	glass, body
-15		4	glass, base
-16		2	glass, body
-17		1	glass, body
-18		3	carbine bullets, .44 cal.
-19		6	rifle bullet, .45 cal.
-20		4	unid. bullet
-21		1	wire nail
-22		1	cut nail
-23		9	unid. metal objects
-24		24	cut nail
-25		25	unid. nail
-26	58	1	unid. metal
-27		1	cut nail
-28		6	window glass
-29		7	slag
-30		4	glass, body
-31		2	glass, body
-32		2	glass, body
-33		1	glass, body
-34		2	glass, body
-35		1	glass, body
-36		1	glass, body
-37		1	round-tipped bullet
-38		3	percussion cap
-39		1	stoneware, body, Bristol-gl.
-40		20	metal/nail frag.
-41		1	rifle bullet
-42		2	slag
-43		3	cartridge
-44		1	glass, base
-45		4	quartz
-46		1	soft paste porcelain, body
-48		1	rifle or carbine bullet
-49		2	whiteware, body, undec.
-50		1	glass, body
-51		1	whiteware, body, dec.
-52		3	rifle bullet, 3-ringed

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-3-53	58	42	lead frag.
-54		3	bone, butchered?
-55		9	cut nail
EU7-4-1	59	1	carbine bullet, 3-ringed
-2		2	rifle bullet, .45 cal.
-3		1	rifle bullet, .45 cal.
-4		9	lead frag.
-5		1	chert ballast
-6		1	glass, body
-7		5	slag
-8		1	brick
-9		1	unid. nail
-10		1	glass, body
-11		2	cartridge, .30 cal.
-12		6	unid. nail
-13		1	cut nail
-14		13	cut nail
-15		2	unid. nail
-16		3	cut nail/spike
-17		1	unid. nail
-18		1	glass, body
-19		1	bone, unid.
-20		1	ferrous alloy concretion
-21		2	cut nail
-22		1	ferrous metal accretion
-23		1	cement/mortar
EU7-5-1	60	4	cement
-2		2	rifle bullet, .45 cal.
-3		10	unid. nail
-4		11	cut nail
-5		12	unid. nail
-6		1	military button, loop shank
-7		2	rifle bullet, .45 cal.
-8		1	unid. metal
-9		1	glass, body
-10		1	glass, body
-11		1	glass, body
-12		3	window? glass
-13		1	Minie ball, 3-ringed
-14		1	carbine bullet, .45 cal.

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-5-15	60	1	unid. ferrous slag
-16		1	bullet, flattened
-17		8	percussion cap
-18		5	lead frag.
-19		3	slag
-20		1	bone, butchered/broken
-21		1	sewer pipe
-22		2	glass, body
-23		5	wood
EU7-6-1	61	1	lead frag.
-2		1	lead frag.
-3		1	window glass
-4		2	glass, body
-5		1	glass, body
-6		1	carbine bullet, 3-ringed
-7		1	rifle bullet, .45 cal.
-8		17	unid. iron frag.
-9		1	iron concretion
-10		1	glass, neck/lip
-11		1	glass, body
-12		1	bone, food
-13		2	rifle bullet, .45 cal.
-14		7	cut nail
-15		1	bone, butchered
-16		1	glass, body
-17		1	cut nail
EU7-7-1	62	16	cut nail
-2		3	unid. nail
-3		4	unid. nail
-4		2	styrofoam
-5		1	plastic
-6		1	plastic
-7		1	bone, unmodified
-8		1	rifle bullet, .45 cal.
-9		1	lead frag.
-10		1	slag
-11		5	percussion cap
-12		5	percussion cap
-13		2	plastic
-14		1	glass, body
-15		1	iron ring

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-fl-1	63	3	cut nail
-2		40	metal frag., unid.
-3		1	slag
-4		1	glass, body
-5		2	glass, body
-6		2	glass, body
-7		3	glass, body
-8		152	lead frag.
-9		3	chert ballast
-10		9	lead frag.
-11		5	cartridge frag.
-12		1	cartridge frag. .30-.06?
-13		1	rifle bullet, .45 cal.
-14		1	plaster
EU7-fl-1	64	2	lead frag.
-2		2	slag
-3		1	ringless Minie ball, .59 cal.
-4		1	unid. bullet
-5		1	rifle bullet, .45 cal.
-6		2	unid. nail
EU7-fl-1	65	1	unid. metal
-2		1	bone, unmodified
-3		1	slag
-4		3	lead frag.
-5		1	bullet, .30-.06 cal.
EU7-fl-1	66	89	lead frag.
-2		44	unid. iron
-3		2	slag
-4		1	glass, body
-5		1	rifle/carbine bullet, 3-ringed
-6		2	percussion cap
-7		30	cartridge casing frag.
EU7-fl-1	67	1	window glass
-2		4	chert ballast
-3		1	cartridge frag.
-4		9	unid. nail
-5		1	cut nail
-6		2	slag
-7		1	glass, body
-8		3	glass, body
-9		137	lead frag.

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
EU7-f1	68	1	wood sample
BT3-1-1	69	1	pebble
BT8-B-1	71	4	unid. nail
-2		1	glass, base/body
-3		1	cartridge
-4		1	glass, body
-5		1	unid. iron
-6		1	pipestem, 1/16" bore
-7		1	military button, loop, 1821
-8		1	wire nail
BT8-A-1	70	1	rifle bullet, .45 cal.
-2		1	cartridge, .31 cal.
-3		1	lead frag.
-4		1	cartridge shell
-5		1	hard paste porcelain, rim
-6		3	cut spike
BT11-1	72	2	slag
-2		1	slag
-3		1	unid. metal rod
-4		1	wire frag.
-5		1	glass, base
BT12-1	73	1	copper wire
-2		1	whiteware, base, undec.
BT15-1	74	1	single shot cannon ball
-2		1	cut spike
-3		2	slate
-4		1	whiteware, body, dec.
-5		1	glass, body
-6		3	bone, broken
-7		1	glass, body
BT17-1	75	1	sewer pipe
-2		1	redware, body, lead-gl. int.

ARTIFACT INVENTORY

Catalog No.	Bag No.	Qty.	Description
BT18-1	76	34	chert ballast
-2		1	redware, body, unglazed
-3		5	concretion
-4		1	window glass
-5		1	unid. ceramic?
-6		3	stone, unmodified
-7		2	bone, broken
-8		3	ceramic/mortar/plaster
-9		1	brick
-10		3	mortar
-11		1	whiteware, rim, dec.
-12		1	earthenware, rim, unglazed
-13		2	stone
-14		1	unid. metal object
-15		3	earthenware, body
-16		7	slag
-17		2	glass, body
-18		1	earthenware, body
-19		2	glass, body
-20		1	slate
-21		1	cartridge shell, .334 cal.
-22		1	earthenware, body
BT19-1	77	1	redware, body, undec.
-2		1	whiteware, base, dec.
-3		1	12" long metal bar
-4		8	whiteware, base
-5		1	stoneware, body, s-gl.
-6		1	whiteware, base, undec.
-7		1	earthenware, body, undec.
-8		1	whiteware, body, undec.
-9		1	cut nail
-10		1	glass, base
-11		1	earthenware, body
-12		1	glass, base
-13		1	solid lead pipe
-14		1	slag

APPENDIX B

Fort McHenry's Target Area: An Archival and Experimental Archeology Study

by

Heather Bouslog

INTRODUCTION

After the Civil War the American army rapidly changed. Not only did its numbers decrease dramatically, its philosophies and warfare strategies were also changing. To face the Indians on the frontier, the old, tightly knit formations had to be abandoned in favor of the individual marksman in a skirmish order. Whereas the most important qualities of the soldier had been his loyalty and level of discipline, now the soldier strived to be a one man fighting machine -- intelligent, rational, and most of all, a professional marksman. After a rocky beginning in the 1870's, marksmanship became a full-fledged sport in the 1880's. Soldiers at posts in the East and West participated. Evidence from historic maps and documents suggests that Fort McHenry in Baltimore, Maryland, was also caught up in this activity.

This work attempts to explore Fort McHenry's target area using experimental archeology as its primary tool. To provide a contextual setting for Fort McHenry's target area, several background topics will be discussed: characteristics of the peacetime soldier, the roles of the peacetime army, the factors contributing to the sport of marksmanship, and the type of arms, ammunition and targets used by soldiers of the late 19th century. These questions were explored using the traditional means of library and archival research.

When researching Fort McHenry's target area specifically, the historic record was incomplete. Historic maps showed that there had been a target area (Fig. B1). Documents described work that had been done on Fort McHenry's stone target butt and the archeological excavations in

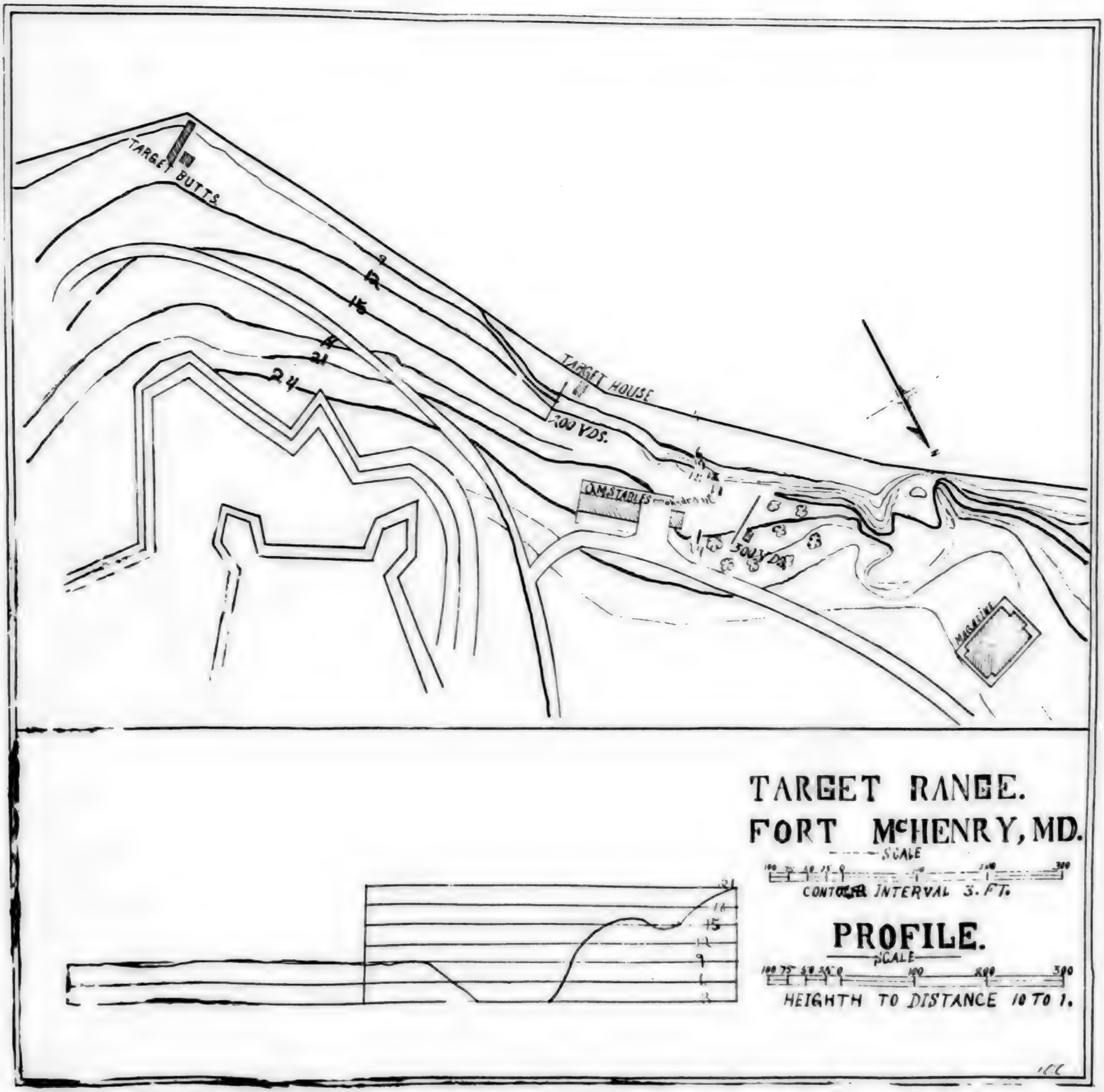


Figure B 1. Target range at Fort McHenry, c. 1907 (National Archives, Record Group 77, Misc. Forts File, Ft. McHenry, Md., Series B, No. 100).

the Fall, 1986, gave further evidence to the range's existence by yielding 563 bullets and lead fragments from two five by five foot squares located where the stone rifle butt had been (E.U. 6 and 7: Fig. 2). Although these records provided important information, they were not detailed enough, especially lacking in specific information about Fort McHenry's targets. For this reason, experimental archeology was chosen as the primary research tool to identify exactly what type of target material the Fort McHenry soldiers were using on their firing range.

Originally this work served to fulfill a graduate course required at The American University, but as it supplements the body of this report by providing more in-depth information about the target area, it is included here.

BACKGROUND

Introduction

The U.S. Army during the last quarter of the 19th century was not the same army it had been during the Civil War. By 1875, the Army's numbers had dwindled to a strength of only 25,000 compared to a million of only a decade earlier (Coffman 1986). Some people were even surprised that the Army existed after the Civil War. Men, primarily from cities in the East, Northeast and Midwest, joined the peacetime army for several reasons. Not only did the Army provide refuge from the pressures of the Industrial Revolution, it lured men with promises of rank, reputation and success. The peacetime Army provided a variety of services, including assisting in the Reconstruction effort in the South, strike-breaking in Eastern cities, and enforcing the law along the Western Frontier.

During this time of peace between the Civil and Spanish-American Wars, the Army tried to remedy several problems that plagued it. Slow promotions, low pay, and monotonous duties headed the list of widespread soldier's complaints that also included generally unpleasant barrack conditions. Designed to elevate the character and reputation of its soldiers and promote professionalism, the Army emphasized the development of individual military skills and the training of larger units (Coffman 1986:270). Soldiers were instructed in gymnastics and swimming; schools were established at Fort Levenworth, Fort Riley and Washington, D.C. giving soldiers instruction in reading and writing. Medical and theoretical subjects were taught, and lyceums were set up where the men could give professional papers. To relieve the soldier of a monotonous life, the Army operated canteens, held theatricals, dances, celebrations of holidays, and athletic events. "The result was an improvement in the well-being as well as the training of soldiers and a general impetus toward professionalism in the officer corps. The thrust of professional reforms clearly indicated that General Sherman and other leaders had reached the conclusion that the Army's mission in peacetime was to prepare for war" (Coffman 1986:216).

Marksmanship

Marksmanship in the Army got a rocky start during the second half of the nineteenth century. Target shooting remained primarily in the hands of civilian enthusiasts, state militias and the National Rifle Association (NRA). While these clubs were constructing targets and becoming confident with their arms, the Army only allowed each man 10 rounds of ammunition for target shooting a month, and sometimes many of the men never even got that. Marksmanship in the army was in a sad state of affairs in the 1870s Until the 1880's, marksmanship was largely left up to whatever officer was in charge, and its practice was determined by that officer's personal feelings about its value.

During the 1880's, however, a change occured in the American Army. Following the lead set by civilians, state militias, and the NRA, the Army became increasingly involved in marksmanship. Due to this almost zealous devotion, some sources refer to this avid interest in marksmanship as a "craze" (Gilmore:1976 and McChristian:1981). Rigid practices (set up) several times a week, coddling of sharpshooters, and the appearance of team scores in the Army and Navy Journal are just some examples of this craze. International match shooting, presided over by the NRA, became very popular after the Americans defeated a champion Irish team in 1874. These matches were held annually at Creedmoor, Long Island, New York, offering a place where Army regulars could shoot against civilians and the state militia. The initiation of "Gallery Practice" (a reduced-charge practice) was also a response to the growing interest in marksmanship. Soldiers could practice anywhere, even in their barracks, and not be under the constraints of weather or heavy population conditions (McChristian 1981:46). Handloading ammunition also contributed to the target shooting "craze." After 1879, when the Frankford Arsenal began manufacturing reloading kits, soldiers could increase their annual allotment of rounds to 2,500 a year, paying less than half of the cost of Arsenal-loaded cartridges (Gilmore 1976 and McChristian 1981). In McChristian's An Army of Marksman, a retired Brigadier General of the era is noted as saying " . . . [shooting] is rather the fashionable thing to do" (1981:69).

The primary factors contributing to the importance of target shooting in the late 19th century were:

(1) New Military Philosophies and Strategy

"In the years between the Civil and First World War, a new theory of military individualism spread through the U.S. Army . . . " (Gilmore 1976:97). New ideas about what qualities made a good soldier developed. Each man was supposed to be a fighting machine on his own. The new soldier was intelligent, logical and subjective, and had initiative (Gilmore 1976:97). Advocates of the new Individualism believed that marksmanship was the key to military reforms while detractors felt that having each man a separate fighting unit would only lead to a collapse of discipline and eventual anarchy.

Military strategy had to change when soldiers encountered the Indians on the western frontier. Because the Indians were moving targets, the old strategy of tightly knit formations would not work. Instead the troops had to fight in skirmish order. This new strategy dictated that soldiers be thrown out in a single rank, separated by 10 foot intervals, and that they fire individually. Perhaps Custer's troops would not have suffered the horrendous massacre in 1876 had they been prepared to fight individually and more effectively. Although reforms were not made immediately after Custer's Last Stand, this battle helped form the attitude promoting marksmanship training for the soldier (McChristian 1981 and Gilmore 1976).

Professionalism played an important part in the changing ideology. In the military as well as in the civilian world, leaders were calling upon the services of professionals. The new soldier was seen as a professional fighting machine preparing for war. Training in marksmanship was fundamental to this new status. Articles devoted to the promotion of marksmanship in the Army and Navy Journal were read by soldiers of this period. Tactical manuals which included target shooting were written following the Civil War.

Although several manuals were written, it was Colonel T.T.S. Laidley's Manual of 1879 that brought about the great awakening in the U.S. military (McChristian 1981). Laidley's system followed the National Rifle Association's system in having three targets: 1) target with an eight inch bullseye; 2) target with a twenty-two inch bull; and 3) "Robin Hood" target having a thirty-six inch bull. All the targets were printed black on a white background with the bullseye, center, and inner divisions laid out in concentric circles. Laidley also delegated the Ordnance Department as the official supplier of targets. Firing was done at 100 and 200 yards offhand, 300 yards kneeling, and in the prone position at 500 and 600 yards (McChristian 1981:43). Prizes and "indulgences" for sharpshooters were suggested in Laidley's manual. The brass and silver stadia were the official prizes through the mid-1880's. In 1884, Army headquarters authorized two new insignia: marksmen pin and sharpshooter's cross.

(2) Weapon Technology

The changing military philosophies and strategies were interwoven with the advances in weapon technology. Muzzle loaders did not lend themselves well to effective skirmishing with the Indians. The predominant infantry combat formation had been battle lines drawn up to point-blank range. The victors were usually the ones who delivered the most lead (McChristian 1981:8).

Starting in the 1820's experiments were initiated for developing a new arms system. The French revolutionized small arms by developing a system of rifling. The advances made by the French interested American Ordnance experts. Tests were conducted at the Harpers Ferry Arsenal to improve upon the French system. Improvements on the French Minie bullet were adopted by the United States Army in the years preceding the Civil War. As technology advanced, arms were altered to adapt to the new ammunition improvements. First, musket barrels were rifled, then later, as it became clear at the end of the Civil War that the future belonged to the breech-loader and metallic cartridge (before this cartridges had been made out of paper, then linen), muzzle loading rifles were converted to handle the breech-loaded ammunition (Butler 1971).

In 1872, the Ordnance Board undertook the task of finding a better cartridge and a lighter weapon. The .50/70 cartridge had been used up to this point and, although it was definitely an improvement over the .58 caliber musket cartridge, it lacked the power and accuracy for the longer ranges encountered in the west. The Springfield Breech-loader itself had evolved through models of 1868 and 1870 to become a much more refined weapon, but, at 9 1/4 pounds, it was still considered too heavy to carry into combat easily (McChristian 1981:26).

After careful analysis of breakages, misfires, and comments from field officers in the Trial of 1871, the Ordnance Board chose the "trapdoor" Springfield as its standard issue for all branches of the Armed Services. Its .45/70/405 cartridge was ballistically superior to the .50/70, and the rifle was a pound lighter than the earlier model. The board concluded that the "trap-door" Springfield was a durable arm, and "unquestionably one of the best made and finished arms ever produced by the National Armory" (McChristian 1981:27 and Butler 1971). This rifle was used up to and throughout the Spanish-American War (Waite and Ernst 1980).

Later, more advances were made. A heavier bullet was adopted by the Army for longer combat ranges (over 400 yards) and the Ordnance Department experimented with greater charges of powder. As Brigadier General John Gibbon in 1882 said, "If you intend to fight Indians, first perfect the rifle, and then teach your men to rely on it rather than each other" (Gilmore 1976:98).

(3) Monotonous Life at the Posts

Although not a primary factor, the monotonous life at the posts undoubtedly contributed to the interest in marksmanship. Target shooting was an excellent escape from boredom, and practices were always well attended, as depicted by the following:

Inspection Report for Fort McHenry of May 5th, 1888 describing the drills and target practice: "Daily drills except on Saturdays and Sundays are properly attended; the prescribed Infantry target practice to and including 500 yards with good results" (HARP 1888). According to another Inspection Report dated six years earlier, there were 14 officers and 110 enlisted men stationed at Fort McHenry during this time. This Inspection Report states that the men were instructed in the Manual of Arms and well instructed in target practice (HARP 1866-89).

Arms, Ammunition and Target

The type of rifle and ammunition the soldiers were using for target shooting during the latter half of the 19th century were:

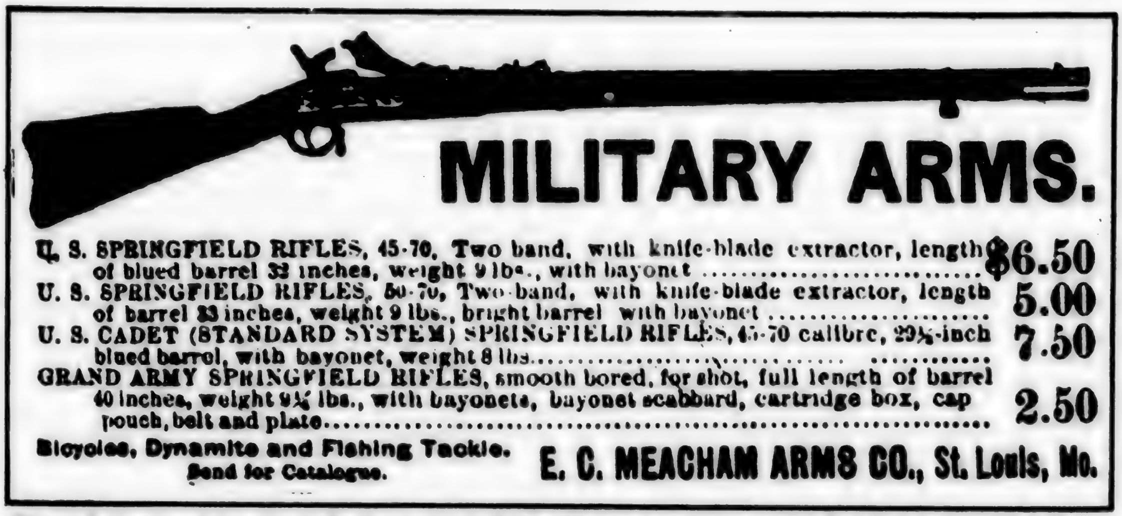
(1) Arm: "Trap-Door" Springfield Rifle

The target shooting weapon that the men at Fort McHenry would have been using was the trap-door Springfield rifle, 1873 vintage, the new models being sent to the Western frontier (Harry Hunter, personal communication). In the Inspection Report for June 18, 1882, it is reported that, "the appearance of the men was excellent and their bearing soldierly and discipline appeared good. Arms Springfield Rifles. Cal. .45. Arms and accoutrements in good condition" (HARP 1866-89).

Under provision of an Act of Congress of June 6, 1872, a board of officers convened in New York City to test breech-loading systems in order that they might adopt a modern breech-loading arm for use in the military service. After numerous exhaustive tests the board recommended the Springfield breech-loading system (Figs. B-2 and B-3). The trap-door Springfield was made at the Springfield Armory in Springfield, Massachusetts (Carey 1953).

(2) Ammunition .45/70/405

At the same time that the Springfield Rifle was being selected for service, the .45 caliber was also chosen as the standard caliber for all arms -- rifles, carbines and revolvers (Gluckman 1959:290 and Woody Schmalz, personal communication). Developed by the Frankford Arsenal,



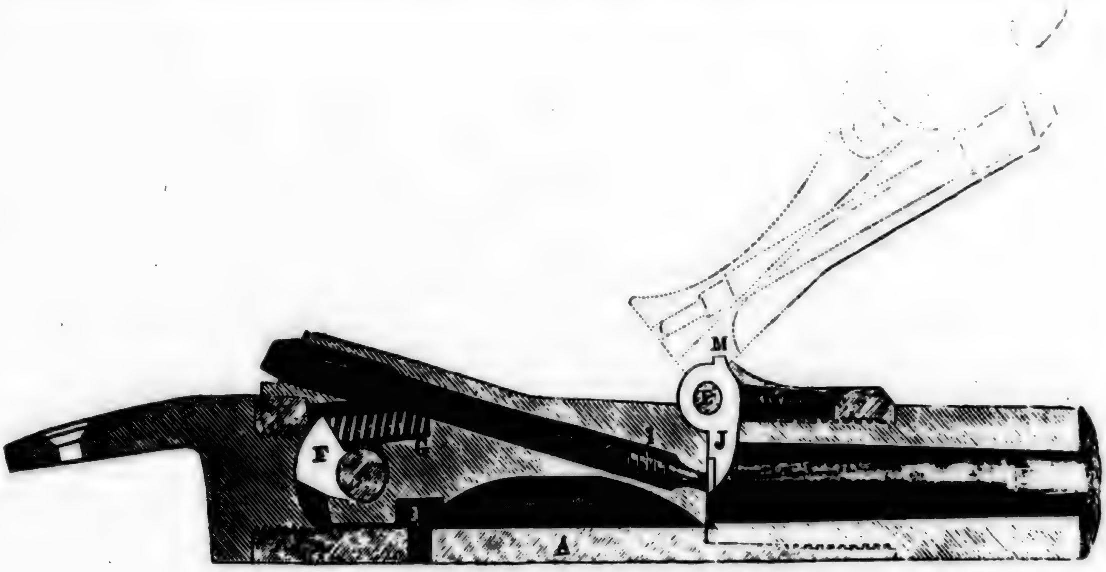
MILITARY ARMS.

U. S. SPRINGFIELD RIFLES, 45-70, Two band, with knife-blade extractor, length of blued barrel 32 inches, weight 9 lbs., with bayonet	$6.50
U. S. SPRINGFIELD RIFLES, 50-70, Two-band, with knife-blade extractor, length of barrel 33 inches, weight 9 lbs., bright barrel with bayonet	5.00
U. S. CADET (STANDARD SYSTEM) SPRINGFIELD RIFLES, 45-70 calibre, 29½-inch blued barrel, with bayonet, weight 8 lbs.	7.50
GRAND ARMY SPRINGFIELD RIFLES, smooth bored, for shot, full length of barrel 40 inches, weight 9½ lbs., with bayonets, bayonet scabbard, cartridge box, cap pouch, belt and plate	2.50

Bicycles, Dynamite and Fishing Tackle.
Send for Catalogue.

E. C. MEACHAM ARMS CO., St. Louis, Mo.

Figure B 2: An ad for the U.S. Springfield Rifle ("Army and Navy Journal" 22(3), August 16, 1884).



Breech mechanism of the Springfield Model 1873 rifle and carbine. Except for its shorter receiver head, the design of its action differed little from that of the previous Model 1870 rifle. Note the high-arched breechblock and firing pin return spring.

The "Springfield Rifle, Calibre .45," is essentially similar to the "Springfield Musket, Model 1870," which for some time past has been in the hands of troops for trial. The following changes have been made: —

1st. The Barrel has been made of low steel instead of iron, and the calibre has been reduced from .50" to .45". The rifling consists of three plain concentric grooves equal in width to the lands, .005" deep, with a uniform twist of one turn in twenty-two inches.

2d. The Lock Plate has been reduced in thickness, and has no bevel on the edge.

3d. A rounder shape has been given to the hammer.

4th. The heads of the Tang Screw, Tumbler Screw and Side Screws have been rounded off, and the Side Screws have been slightly shortened.

5th. A screw has been substituted for the rivet of the Guard Bow Swivel.

6th. The shape of the Rear Sight has been changed, and it has been set further forward on the barrel.

7th. The metal parts of the Rifle have all been browned or blackened.

8th. The Stock has been rounded off near the lock plate, and on its upper edges, as far forward as the lower band.

9th. A number of cannelures have been cut near the small end of the Ramrod, in order to give a better grip to the fingers in using it.

10th. The shape of the Upper Band and of the Gun Sling Swivel have been changed, and an open or stacking swivel has been added for the purpose of stacking arms without using the bayonet.

The changes in the Carbine follow those above indicated in the description of the Rifle.

Figure B 3. Breech mechanism of the Springfield Model 1873 Rifle Carbine (Waite and Ernest 1980:22).

the .45/70/405 (.45 - caliber; 70 = grains for the loading powder; 405 = grain of the bullet) was specified in extreme detail.

Through experimentation, shooters found that very powerful cartridges firing heavier bullets at moderate velocities were the most accurate combination for the black powder technology. Thus, in the 1880's, the army went to a more powerful cartridge that was loaded with a 500 grain bullet. The 500 grain bullet actually went against some of the recommendations of the Ordnance Board, including excessive recoil, but the 500 grain bullet became standardized. Manufactured at the Frankford Arsenal in 1886, the 500 grain bullet used a copper-colored gilding metal for the case material. The .45/70 cartridge could drive the 500 grain bullet at a muzzle velocity of approximately 1,200 feet per second (Table I).

The Fall, 1986, archeological excavations conducted by The American University under an agreement with the National Park Service revealed that it was the .45/70/500 cartridge that was used during the late 19th century at Fort McHenry.

Target ranges and targets varied during this period. There were general guidelines, however, that most officers tried to follow. These included keeping the sun to the back of the shooters and having the prevailing winds blow at right angles to the flight path of the shots. Ideally, the ranges would be located one-half to three miles from the garrison and have one to three separate ranges for close-range (100-300 yards), mid-range (500-600 yards), and far-range shooting (800-1000 yards).

The butts on ranges in populated areas were recommended to be about 20 feet high. Early targets were made of canvas with the rings and bulls-eye applied with black paint. Later, the Ordnance Department supplied paper targets. First, square divisions were used, then an elliptical target developed by Colonel Stanhope Blunt was advanced. The outside dimensions of the sheets of paper for the targets were 4' by 6', 6' by 6', and 12' by 6'. Frames were usually constructed utilizing a

CARTRIDGE	BULLET WEIGHT GRAINS	APPROXIMATE POWDER CHARGE GRAINS	MUZZLE VELOCITY FT/SEC	MUZZLE ENERGY FOOT/POUNDS
56-56 Spencer	450	40	960[1]	921[1]
50-70 Army	450	70	1240	1440[2]
45-70 Army	500	70	1201	1602[3]
45-100 Sharps	550	100	1360	2240[4]
44-77 Sharps and Remington	365	77	1460	1730[4]
44-90 Sharps	520	90	1270	1860[4]
44-100 Remington	550	100	1380	2338[4]
40-90 Ballard	370	90	1427	1672[4]
38-55 Winchester	255	55	1320	985[3]
32-40 Winchester	165	40	1440	760[3]

[1] Calculated by an accurate predictive computer program.
[2] Ordance Bureau Tests 1870's.
[3] Winchester tested ballistics 1916.
[4] From early manufacturers' catalogs.

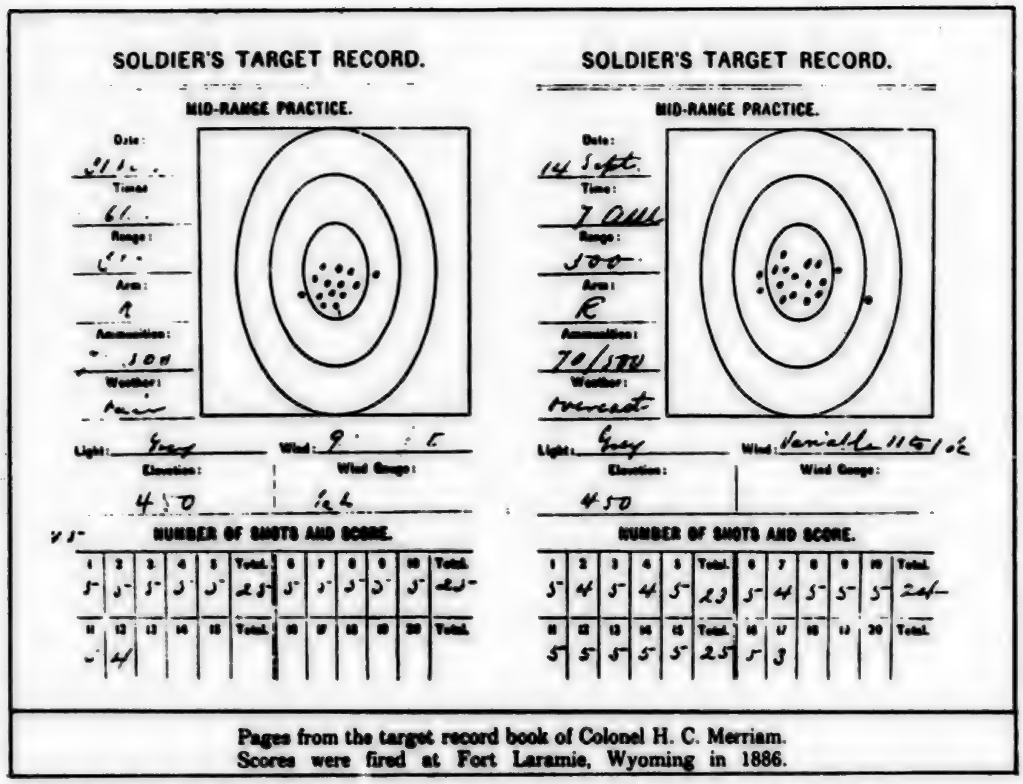
Table I. Ballistics of cartridges of the 19th century (Butler 1971: 126).

light wooden skeleton covered with tightly stretched canvas, but these were times of experimentation and many targets were tried. One such target was the Brinton target used primarily in the East. The Brinton target incorporated two targets on separate frames arranged so as to slide past each other like the movement of a double-hung window. In this way, a fresh target could be raised while the other was being patched. Long range targets consisted of board-covered frames and were always stationary (McChristian 1981:72).

Targets were usually located 20-30 feet in front of the target butt. Directly in front of the targets or off to the side but still within good view were the pits which protected the soldiers who marked the scores of the shooters. The pits were dug 3-4 feet deep with additional dirt mounded up toward the firing lines. The pits were lined with lumber or logs to keep the sides from eroding. The target markers sat in the pit with their backs to the firing line so they could have a good view of the target in front of them (McChristian 1981:72).

Target practice was regulated by a bugler, who sounded the calls for "commence firing" and "cease firing". Two privates and one noncommissioned officer would mark the shots. The shot-markers would crouch in the pits and raise a disk attached to either end of an eight foot pole. The disk was white on one side denoting a bulls-eye and the reverse was red for a center score. The disk on the other end of the pole would have a black "S" to mark an inner hit and a reverse of black to denote an outer hit. A complete miss was a waved danger flag across the target. A noncommissioned officer behind the firing line would call out the value and position of the shot and would record it in the company book (Figs. B4) (McChristian 1981).

Unfortunately there is no mention of a specific target used at Fort McHenry during this period. Perhaps the Brinton target was used. However, there is documentation relating to target range. According to a letter written May 4, 1888 addressed to the Commanding General, Division of the Atlantic, Fort McHenry needed $109.30 for the completion of the stone rifle butt and for target frames (HARP 1866 - 1889). Fort



SOLDIER'S TARGET RECORD.

MID-RANGE PRACTICE.

Date: [illegible]
Time: 61.
Range: [illegible]
Arm: R
Ammunition: [illegible]
Weather: Fair
Light: Grey
Wind: 9 [illegible] E
Elevation: 450
Wind Gauge: [illegible]

NUMBER OF SHOTS AND SCORE.

1	2	3	4	5	Total.	6	7	8	9	10	Total.
5	5	5	5	5	25	5	5	5	5	5	25
11	**12**	**13**	**14**	**15**	**Total.**	**16**	**17**	**18**	**19**	**20**	**Total.**
5	4										

SOLDIER'S TARGET RECORD.

MID-RANGE PRACTICE.

Date: 14 Sept.
Time: 7 am
Range: 500
Arm: R
Ammunition: 70/500
Weather: overcast
Light: Grey
Wind: Variable 11 to 1 o'c
Elevation: 450
Wind Gauge:

NUMBER OF SHOTS AND SCORE.

1	2	3	4	5	Total.	6	7	8	9	10	Total.
5	4	5	4	5	23	5	4	5	5	5	24
11	**12**	**13**	**14**	**15**	**Total.**	**16**	**17**	**18**	**19**	**20**	**Total.**
5	5	5	5	5	25	5	3				

Pages from the target record book of Colonel H. C. Merriam.
Scores were fired at Fort Laramie, Wyoming in 1886.

Figure B-4. An example of a soldiers' target record (McChristian 1981:81).

McHenry undoubtedly had target practice before this time (as described by the 1882 Inspection Report mentioned earlier). Letters dating from 1887 concerning the construction of a new artillery range also mention the rifle target butt as being next to the seawall. An artillery target was placed on the inside edge of the already existing butt (HARP 1888).

At Fort McHenry, the target area was located so that the afternoon sun would fall on the backs of the shooters and the prevailing west winds would blow at roughly right angles to the bullets' flight paths. The 1888 map showing the target area does not give much detail as to how far the men were shooting. However, the 1907 map and the 1912 map show that the men would be shooting from three different distances - 100, 200, and 300 yards (Figs. 11 and 4).

THE EXPERIMENT

Research Design

During the Fall, 1986, excavations at Ft. McHenry, it was noted that Excavation Units (E.U.) 6 and 7 yielded a large quantity of bullets and lead fragments. These findings prompted further research to gain a wider understanding of the target area. Although it was discovered that a stone rifle butt had been used on the range (HARP 1866-1888), most of the excavated bullets were undamaged with only small amounts of compression and fragmentation leading to the assumption that the bullets probably had not impacted the stone rifle butt.

This experiment was designed to specifically identify what type of material was used at Fort McHenry for the targets, or as a target/butt "buffer," "buffer" referring to the material used between the targets and the stone target butt.

For the purposes of the experiment, it is assumed that bullets shot in 1987 at similar materials in similar conditions will show similar characteristics of those bullets excavated from E.U.s 6 and 7 that were shot in the later 1880s.

Methodology

On May 9 and July 4, 1987, a team of 8 volunteers conducted the archeological experiment on private land near Maryland Rte. 340. The crew included: Heather Bouslog, Michael Bouslog, Bob Hines, Eric Hines, Bill Ring, Andrea Shapiro, Gianna Sullivan, and Paula Zitzler. Conditions for both days were comfortable. May 9th was a beautiful day with blue skies, no wind, and the sun at our left. July 4th, also windless, was overcast and slightly damp from overnight rain.

In order to identify the target and buffer material was used at Fort McHenry, a comparative test was designed. A replication of conditions existing at the Fort during the late 19th century was attempted.

First, five target materials were chosen ranging from relatively soft materials (Black Pine) to hard material (Granite Capstone from Fort McHenry's seawall). These materials were: pine and oak planks (3/4" thick); sheet metal (1/16" thick); brick and granite (1.5" thick).

Using a replica of an 1872 Trap-door Springfield rifle, a total of 84 shots were fired at the various targets from a distance of 100 feet. Historical data indicated that most close-range firing was done from at least 100 yards, but the constraints of our marksmanship abilities allowed us to shoot from only 100 feet. Although the trap-door used for the experiment was not a replica of the 1873 model, the 1873 and the 1872 models fired similarly enough for the purposes of the experiment (Robert Hines, personal communication, 1987). The ammunition was the .45/70/300. Initially, a total of 100 rounds was going to be shot, but when it became apparent that the variability of impact characteristics of bullets shot at the same target was minimal, the number of rounds fired at each target was decreased.

To retrieve the bullets for later analysis a system was devised consisting of a metal trash can with a 17.5 inch opening. The trash can was filled with dirt and leaned on its side in a dug-out gulley to keep it from rolling. The target was placed in the opening with the dirt serving as the butt. Nine practice bullets were used over both days to sight-in the rifle. After all the rounds had been fired for each specific target, the trash can's dirt was screened through 1/4" mesh for bullets and lead fragments. The bullets were collected and separated by target for later analysis. A metal detector was used to aid in finding bullets/bullet fragments which might have richocheted from the targets. Unfortunately, the metal detector was not available for the second day, but it was found that the metal detector was not a significant factor in the retrieval system.

Occassionally the firing had to be stopped because the rifle malfunctioned. The firing had to be completely halted May 9th because a spring came loose in the trap-door and had to be fixed professionally. On July 4th, the gun jammed several times so that the shell could not be extracted after firing. Fortunately this problem could be fixed at the shooting site.

In an effort to identify the material used at Fort McHenry as its target or target/butt buffer, the newly fired experimental bullets were compared to a sample of the bullets excavated from E.U.s 6 and 7. The comparisons included weighing the bullet on a OHAUS Triple Beam Balance before and after firing, and visual inspection. Essentially the analysis consisted of comparisons between the known (experimental bullets) and the unknown (the excavated bullets). For example, if one of the experimental bullets that was fired at the black pine target exhibited similar characteristics of impact damage as a bullet excavated from E.U. 6 or 7, it would be inferred that the bullet excavated from Fort McHenry had impacted a soft material, such as the black pine.

Results and Interpretations

Despite rifle problems, the experiment went fairly smoothly. After sighting-in, an average of 77% of the bullets fired hit the target. Of those hits an average of 86% were retrieved. Table II describes the numbers and percentages in more detail.

TABLE II. Number and Percent of Bullets Fired, Hits and Bullets Retrieved

				BULLETS RETRIEVED		
TARGET	BULLETS FIRED	NO. OF HITS	PERCENT. OF HITS	NO. OF FRAGS.	NO. OF EST. BULLETS	PERCENT. OF HITS RETRIEVED
Black Pine	18	13	72%	35	13	100%
Oak	18	7	38%	15	7	100%
Sheet Metal	15	11*	77%	76	10	91%
Brick	14	14	100%	65	14	100%
Granite	10	10	100%	18	4	40**

*estimated number of hits
**Because granite is a very hard material, bullets hitting this target immediately richocheted outside the target area. Despite using a metal detector, very few of the fragments and bullets could be found.

Although the experiment went smoothly, the results did not support an exact identification of the material used at Fort McHenry as a target or target/butt buffer. Before conducting the experiment, an elaborate system for measuring and comparing impact damage was designed. It soon became apparent, however, that there was no need for exact measurements to show that there were drastic differences between the experimental and excavated bullets. Figure B-5 shows the visual comparison between a new unfired bullet, selected experimental bullets and bullets selected from E.U.s 6 and 7, Level 3. The excavated bullets are extremely compressed and fragmented making them almost unidentifiable.

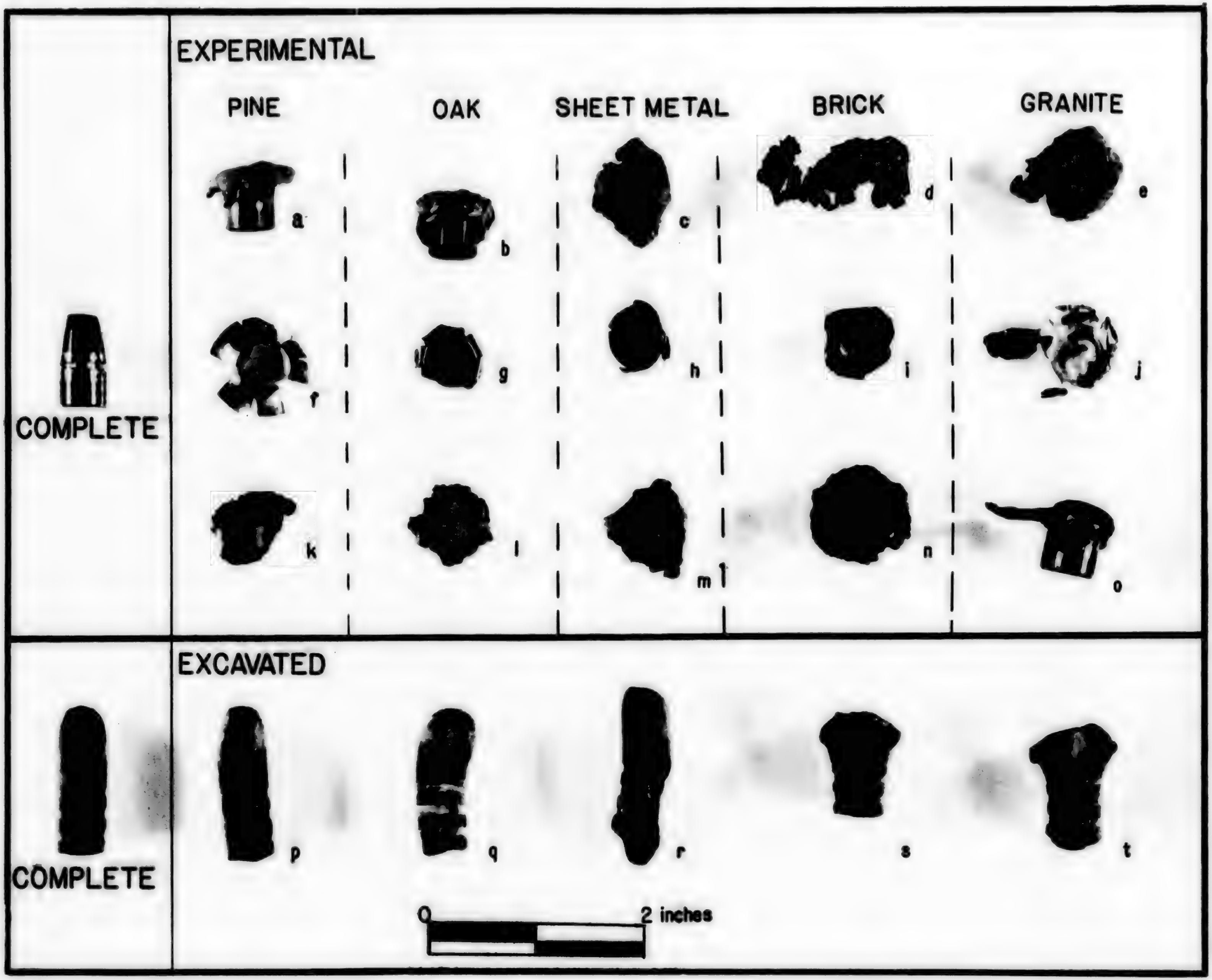


Figure B-5. Visual comparison of experimental and excavated bullets. Jacket and lead: a, b, o. Jacket: f–j. Lead: c–e, k–n, p–t. Complete bullet (excavated) from E.U. 6, lev. 3–63. Other excavated bullets from E.U. 7, lev. 3–19.

TABLE III. AVERAGE WEIGHTS BEFORE AND AFTER FIRING

	n	Original Wt.*	Wt. after Firing	Percentage of Weight Lost to Fragmentation, etc.
Experimental Bullets:				
Black Pine	14	19.44	16.5	15.2%
Oak	7	"	16.9	13.9%
Sheet Metal	10	"	13.3	31.6%
Brick	14	"	12.3	36.8%
Granite	4	"	14.2	27.0%
Excavated Bullets:				
E.U. 6, Lev. 3	17	32.4**	30.2	6.8%
E.U. 7, Lev. 3	11	"	30.4	6.2%

*All weights in grams.
**A 500 grain bullet = 32.4 grams

Table III shows that there is a rough correlation between the type of target impacted and the percentage of the bullet lost to fragmentation. Bullets fired at the softer materials (pine and oak) only lost approximately half the lead compared with bullets fired at the harder targets (sheet metal, brick and granite). It follows that had the firing conditions been exactly the same at Fort McHenry in the 1880's as they were for the 1987 experiment, bullets excavated from E.U.s 6 and 7 would have been fired into very soft materials.

But, the conditions were not exactly the same. To begin with, although both rifles fired .45 caliber bullets, the rifles were different vintages and different bullet grains were used. Soldiers at Fort McHenry used heavier grain (500 grain) bullets, while those fired in the experiment were lighter (300 grain). The powder was different; Fort McHenry's soldiers used black powder; the bullets fired in 1987 used a smokeless powder. Bullets at Fort McHenry were unjacketed; the experimental bullets were jacketed. The firing distances probably were different. In the experiment the team of shooters fired from 100 feet. Sources indicate that close-range shooting during the later 19th century was at least 100 yards.

Table IV summarizes the different conditions between Fort McHenry in the 1880's and the 1987 experiment.

TABLE IV. Shooting Conditions at Ft. McHenry (1880's) and the Experiment (1987)

VARIABLE	FT. MCHENRY (1880s)	EXPERIMENT 1987
Rifle	1873 Trap-door Springfield	Replica 1872 - Trap door Springfield
Rifle Cal.	.45 cal.	.45 cal.
Powder Charge	Unknown	70 grains
Type of Powder	Black Powder	Smokeless Powder
Bullet Grain	500	300
Jacket	Unjacketed	Jacketed
Distance of Firing Point	Unknown (Historic sources point out that the range was 100 yards - 500 yards)	100 feet
Size of Targets	Unknown (Historic sources state that 4x6', 6x6', and 12x6' were widely used)	17.5-inch diameter
Material of Targets/ Target butt buffer	Unknown (sources indicate that canvas, metal, paper, dirt, and wood were among materials used)	Pine, oak, sheet metal, brick, and granite
Weather conditions	Ideal conditions; sun to the back of shooters; wind blowing at right angles to bullets' flight paths.	May 9th, windless, sunny (sun to the side) July 4th, windless (no sun)

There were many reasons that could explain the differences in the damage characteristics between the excavated bullets and those fired experimentally:

(1) If the target butt/buffer at Fort McHenry was an extremely soft material it would cause almost no impact damage at all. Perhaps a bank of sand or even hay bales was used at Fort McHenry.

(2) The soldiers could have used a reduced powder charge for their target shooting. If this were the case, the bullets would have a reduced impact damage.

(3) The difference in distances in the firing points is a major factor in the differences in impact damage. Fort McHenry's soldiers might have been shooting from as far as 500 yards while in the experiment the firing point was only 100 feet.

(4) Differences in the bullet grain might have contributed to differences in impact characteristics. With an approximate powder charge of 70 grains, a 500 grain bullet has a muzzle velocity of about 1200 feet per second. A 300 grain bullet has a muzzle velocity of 1500 feet per second. The experiment would share have produced greater bullet impact damage than would historical conditions (Butler 1971:126).

(5) The target size could indirectly affect the impact damages. For long range firing, shooters need to be able to see the target. Historic sources state that 4 x 6', 6 x 6' and 12 x 6' targets were commonly used. The experiment used only a 17.5-inch diameter target in order to have an effective retrieval system.

(6) Weather conditions could affect the characteristics of impact damages. Wind deflection can affect accuracy, velocity, and efficiency.

Recommendations and Conclusions

The combination of the unavailability of the historically documented firearms and ammunition, with gaps in the historic data, did not allow accurate replication of many of the historic conditions. Exactly simulating these conditions from a time period over a hundred years ago was the key to the successful outcome of this experiment. In retrospect, more stringent control of as many variables as possible would have yielded more meaningful results, and should be considered in any future attempt. In particular, bullet weight, powder charge, range and target size appear to be the significant variables and should have been more carefully duplicated but the unavailability of ammunition as described in the historic documents, and the difficulty encountered in designing an efficient retrieval system for bullets fired at a large target from at least 100 yards were restrictive and prohibitively expensive.

The refinement of the method of this experiment would provide the opportunity to derive an interpretation of the archeological and historical records that exceeds the limits of the recovered data, and contributes to a more complete picture of 19th century marksmanship.

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REFERENCES CITED

Butler, David F.
1971 United States Firearms: The First Century 1776-1876. New York: Winchester Press.

Carey, A. Merwyn
1953 American Firearms Makers When, Where, and What They Made from the Colonial Period to the End of the Nineteenth Century. New York: Thomas Y. Cowell Co.

Church, W.C., ed.
Army and Navy Journal. Microfilm on file at Library of Congress. (o) 82/213 MiCRR, Reel 9-10, v. 22-26, 1884-1888.

Coffman, Edward M.
1986 The Old Army. New York: Oxford University Press.

Gilmore, Russell
1976 "The New Courage: Rifles and Soldier Individualism 1876-1918." Military Affairs. 40 (October 1976).

Gluckman, Arcadi
1959 United States Muskets, Rifles, and Carbines. Harrisburg, PA: The Stackpole Co.

McChristian, Douglas
1981 An Army of Marksmen: The Development of United States Army Marksmanship in the 19th Century. Fort Collins, Co.: The Old Army Press.

Waite, M.D. "Bud" and Ernst, B.D.
Trap-door Springfield: The United States Springfield Single-Shot Rifle 1865-1893. North Hollywood, CA: Beinfield Publishing Co.

Primary Sources:

HARP (The Historical and Archeological Research Project) Files:

National Archives:

Record Group 92. Office of the Quartermaster General RB FM. Description of the History of Fort McHenry 11/24/1888.

Record Group 159. Office of the Inspector General, Letters Received 1866-89. Inspection Reports: 10/5/1888, 6/8/1882, 10/5/1887.

Record Group 77. Office of the Chief of Engineers, Selected Documents from Fortifications, Letters Received, Baltimore District Office 1884-1906. Microfilm Reel 42, Group 1.

Interviews:

Robert Hines	History Teacher: Richard Montgomery High School Rockville, Maryland Interviewed by Heather Bouslog 1/87.
Harry Hunter	Firearms Specialist, Ordnance Division Smithsonian American History Bldg. Interviewed by Heather Bouslog 1/13/87.
Woody Schmalz	Fire Arms and Tool Marks Unit Federal Bureau of Investigation Washington, D.C. Interviewed by Heather Bouslog 1/87.

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APPENDIX C

STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
1	A	10YR 3/3 (dark brown) sandy loam	0.5
	B	10YR 4/4 (dark yellowish brown) silty clay	0.3
	C	7.5YR 3/2 (dark brown) mottled sandy clay containing slag, charcoal, industrial-type burned material; compacted	0.6
	D	2.5Y 2/0 (black) coal dust	0.2
	E	10YR 4/4 (dark yellowish brown) dense clay mottled with 10YR 8/1 (white), 2.5YR 4/6 (red), 10YR 6/6 (brownish yellow), and 10YR 5/1 (gray) clay	1.4
	F	10YR 5/1 (gray) clay	1.5+
2	A	10YR 3/2 (very dark grayish brown) clayey silt with mica particles	0.3
	B	10YR 4/3 (brown/dark brown) clayey silt with mica	0.4
	C	10YR 3/3 (dark brown) silty clay containing coal and charcoal flecks	0.3
	D	10YR 2/1 (black) cinders, coal, rock, and gravels	0.4
	E	10YR 3/4 (dark yellowish brown) silty sand	0.4
	F	10YR 3/2 (very dark grayish brown) sandy silt containing cinders and coal	0.4

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
2(cont.)	G	10YR 3/2 (very dark grayish brown) silty sand loam with pockets of 10YR 5/8 (yellowish brown) slightly sandy clay and brick fragments	0.5
	H	Oyster Shells with 10YR 3/2 (very dark grayish brown) silty sand loam; very little soil matrix	2.0
	I	10YR 6/4 (light yellowish brown) wet, clayey loam containing plaster, mortar, and brick fragments	0.7
	J	10YR 2/1 (black) wet, mucky, tar-laden silty clay	1.2+
3	A	10YR 3/2 (very dark grayish brown) silty loam	0.3
	B	10YR 5/4 (yellowish brown) silty loam	0.2
	C	10YR 2/1 (black) silty loam containing cinders, coal, and ash	0.5
	D	10YR 3/1 (very dark gray) silty clay mottled with 10YR 5/8 (yellowish brown) and 10YR 4/2 (dark grayish brown) clay	0.2
	E	10YR 5/8 (yellowish brown) clay	0.2
	F	10YR 2/1 (black) cinders, coal, and ash	0.7
	G	Oyster Shells with 10YR 3/3 (dark brown) silty clay	0.8

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
3(cont.)	H	Oyster Shells with 10YR 2/1 (black) silt; very little soil matrix; shells found lying horizontally	0.8
	I	10YR 5/4 (yellowish brown) and 7.5YR 5/6 (strong brown) banded clays with pockets of sand	0.2
	J	10YR 6/4 (light yellowish brown) sand containing decayed mortar and plaster, and brick fragments	0.3
4	A	10YR 3/1 (very dark gray) silty clay loam	0.3
	B	10YR 3/1 (very dark gray) silty clay loam with pea-sized gravel	0.1
	C	10YR 4/3 (brown/dark brown) sandy loam with mottles of Stratum E	0.3
	D	10YR 4/3 (brown/dark brown) sandy clay	0.2
	E	7.5YR 5/8 (strong brown) sandy clay	0.3
	F	10YR 2/1 (black) coal and coal dust	0.2
	G	10YR 4/1 (dark gray) with mottles of Stratum E	0.4
	H	Fist-sized, coarse rip-rap; very little soil matrix	0.4
	I	10YR 5/6 (yellowish brown) sandy clay mottled with 10YR 7/1 (light gray) clay	0.6

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
4(cont.)	J	Oyster Shells; shucked, lying horizontally; very little soil matrix	1.5+
	K	10YR 4/4 (dark yellowish brown) sandy clay	0.3+
	L	10YR 5/6 (yellowish brown) clay containing charcoal flecks and brick fragments	0.2+
5	A	10YR 3/3 (dark brown) silty loam	0.3
	B	10YR 4/4 (dark yellowish brown) clayey silt mottled with 2.5YR 4/6 (red) clay and containing some cinders and mica particles	0.5
	C	10YR 2/1 (black) cinders, slag, and coal; small lense	0.3
	D	10YR 3/3 (dark brown) silty sand loam containing some cinders, oyster shells and many small angular rocks	0.5
	E	Oyster Shells with 10YR 3/3 (dark brown) silty clay	1.1
	F	7.5YR 4/6 (strong brown) silty clay mottled with 7.5YR 5/8 (strong brown) silty clay and 2.5YR 4/6 (red) and 10R 3/6 (dark red) clay	0.8
	G	7.5YR 4/6 (strong brown) clayey sand	0.4

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
5(cont.)	H	7.5YR 4/4 (brown/dark brown) slightly sandy clay with pockets of 10YR 4/1 (dark gray) clay containing brick fragments, mortar, and charcoal flecks	1.1
	I	7.5YR 5/4 (brown) slightly sandy, wet clay containing brick and mortar rubble	1.0+
6	A	10YR 4/3 (brown/dark brown) silty clay loam with flecks of brick	0.6
	B	10YR 5/4 (yellowish brown) silty clay	0.3
	C	10YR 3/2 (very dark grayish brown) ash, cinder deposit containing oyster shells and some water-rounded marble-sized gravel	0.5
	D	7.5YR 4/2 (brown/dark brown) clay and 10YR 5/6 (yellowish brown) clay; hard, compacted	0.8
	E	10YR 3/3 (dark brown) sandy clay with flecks of charcoal; homogenous	0.4
	F	7.5YR 3/2 (dark brown) fine sandy clay	0.1
	G	7.5YR 4/4 (brown/dark brown) fine sandy clay	0.1
	H	10YR 5/4 (yellowish brown) sandy clay; homogenous	0.5+
	I	10YR 4/3 (brown/dark brown) silty clay with many flecks of charcoal and pea-sized water-rounded gravel	0.3+

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
7	A	10YR 4/3 (brown/dark brown) sandy loam	0.3
	B	10YR 4/3 (brown/dark brown) sandy loam containing small thumbnail-sized broken rocks, cinders and mottles of clay	0.4
	C	10YR 5/4 (yellowish brown) sandy clay with mottles of clay	0.5
	D	10YR 4/3 (brown/dark brown) sandy loam with 10YR 5/4 (yellowish brown) sandy clay mottles	1.1
	E	7.5YR 4/4 (brown/dark brown) clay with flecks of charcoal	1.2+
	Fea. 1		
	Level 1	10YR 3/2 (very dark grayish brown) silty clay containing flecks of charcoal	0.6
	Level 2	10YR 4/3 (brown/dark brown) clayey silt mottled with 10YR 4/6 (dark yellowish brown) clay and containing charcoal, wood and lead fragments	0.8
A	B	10YR 5/6 (yellowish brown) silty clay mottled with 10YR 7/1 (light gray), 7.5YR 6/2 (pinkish gray), and 10YR 4/3 (brown/dark brown) dense clay	0.8
	C	10YR 4/4 (dark yellowish brown) sandy clay	1.4+

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
A(cont.)	Fea. A2		
	Level 1	10YR 3/2 (very dark grayish brown) clayey silt containing fist-sized gravel and oyster shells	0.6
	Levels 2-4	10YR 3/6 (dark yellowish brown) sandy loam mottled with 10YR 7/1 (light gray), 10YR 4/3 (brown/dark brown), 10YR 5/6 (yellowish brown), and 10YR 4/8 (red) clay	2.2+
B	A	10YR 5/6 (yellowish brown) and 7.5YR 5/6 (strong brown) silty clay with pockets of dense clay	1.5
	B	10YR 4/6 (dark yellowish brown) sandy silt containing charcoal, brick fragments, and mortar	?
	Fea. A2		
	Levels 1-4	Same as Excavation Unit A	1.6+
C	A	10YR 4/6 (dark yellowish brown) and 7.5YR 4/6 (strong brown) silty clay	1.0
	B1	10YR 5/8 (yellowish brown) mottled with 10YR 4/4 (dark yellowish brown) clay	0.5
	B2	10YR 4/3 (brown/dark brown) dense clay mottled with 7.5YR 4/6 (strong brown) sandy clay and 7.5YR 5/6 (strong brown) clayey sand	0.4

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STRATA SUMMARY

EXCAVATION UNIT	STRATUM	DESCRIPTION (color*/texture	THICKNESS (feet)
C(cont.)	Fea. A2		
	Levels 1-2	10YR 3/6 (dark yellowish brown) sandy loam mottled with 10YR 7/1 (light gray), 10YR 5/6 (yellowish brown), and 10YR 4/3 (red) clay	1.3
	Levels 2-4	10YR 3/6 (dark yellowish brown) sandy loam mottled with 10YR 7/1 (light gray), 10YR 5/6 (yellowish brown), 10YR 4/3 (red), and 10YR 4/3 (brown/dark brown) clay	1.0
	Level 5	10YR 5/4 (yellowish brown) sandy silt	0.4+

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
1	A	10YR 3/2(very dark grayish brown) clayey loam	0.5
	B	Mixed soils, brick	0.4
	C	5YR 3/1 (very dark gray) clayey loam	0.3
	D	7.5YR 2/0 (black) cinders	0.3
	E	7.5YR 4/6 (strong brown) clay mottled with 10YR 6/8 brownish yellow) clayey sand and 10YR 8/2 (white) sand	1.2
	F	Oyster Shells	0.4
	G	7.5YR 4/6 (strong brown) clay	2.5+
2	A	10YR 3/2 (very dark grayish brown) silty loam	0.5
	B	10YR 4/4 (dark yellowish brown) silty clay with flecks of charcoal	0.3
	C	10YR 2/1 (black) cinders, coal	0.3+
3	A	10YR 4/3 (brown/dark brown) silty clay; containing mica particles	0.2
	B	10YR 3/3 (dark brown) silty clay loam mottled with 10YR 4/4 (dark yellowish brown) and 7.5YR 4/6 (strong brown) silty clay; cinders	0.4+
4	A	10YR 4/1 (dark gray) sandy silt loam containing cinders and charcoal	0.9
	B	10YR 5/6 (yellowish brown) compacted silt-sand with gravel, brick, and mortar	0.5

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
4(cont.)	C	10YR 4/4 (dark yellowish brown) silty clay	1.2
	D	10YR 5/4 (yellowish brown) silty clay	1.6
	E	10YR 4/6 (dark yellowish brown) sandy silt clay	3.0+
5	A	10YR 3/3 (dark brown) sandy loam	0.6
	B	10YR 4/4 (dark yellowish brown) silty loam	0.6
	C	2.5YR 4/8 (red) possible decomposed brick mottled with 10YR 6/6 (brownish yellow) sand	1.2
	D	7.5YR 5/4 (brown) clay	1.8+
6	A	10YR 3/3 (dark brown) silty loam	0.6
	B	10YR 3/2 (very dark grayish brown) silty loam mottled with 10YR 5/6 (yellowish brown) sandy clay	2.0
	C	7.5YR 5/6 (strong brown) silty clay	2.0
	D	10YR 3/2 (very dark grayish brown) silty loam	1.1
	E	10YR 4/3 (brown/dark brown) sandy loam	1.8+
	F	5YR 4/6 (yellowish red) compacted clay with black iron-like concretions	1.3+

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
7	A	10YR 3/3 (dark brown) sandy loam	0.5
	B	10YR 4/3 (dark brown) clay mottled with 10YR 4/4 (dark yellowish brown) and 10YR 4/1 (dark gray) clay	0.6+
		Cement Pier	0.6-?
8A	A	10YR 3/2 (very dark grayish brown) silty loam with slag and charcoal	0.7
	B	10YR 6/4 (light yellowish brown) sand	0.5
	C	10YR 4/3 (brown/dark brown) clayey sand silty mottled with 10YR 6/6 (brownish yellow) and 10YR 3/1 (very dark gray) clayey sand; with wood fragments, charcoal and mortar fragments	0.7
	D	10YR 4/3 (brown/dark brown) sandy loam mottled with 10YR 5/6 (yellowish brown) sandy loam; lots of wood fragments and charcoal	0.3
	E	10YR 5/8 (yellowish brown) sandy clay mottled with 10YR 6/6 (brownish yellow) sandy clay	0.5
	F	10YR 4/2 (dark grayish brown) dense clay mottled with 10YR 4/4 (dark yellowish brown) clay and containing water-rounded gravel	0.3
	G	10YR 4/4 (dark yellowish brown) compacted sand	0.3

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
8A(cont.)	H	10YR 4/3 (brown/dark brown) sandy clay mottled with 10YR 3/1 (very dark gray) clay; many ferrous concretions	0.6
	I	7.5YR 4/4 (brown/dark brown) dense clay mottled with 7.5YR 4/6 (strong brown) clay; many ferrous concretions	1.0+
		Cement Pier	2.8
8B	A	10YR 3/2 (very dark grayish brown) silty loam with small gravel and mortar	0.3
	B	10YR 4/3 (brown/dark brown) sandy clay mottled with 10YR 7/8 (yellow) sandy clay and containing mortar and brick fragments	2.1
	C	10YR 5/8 (yellowish brown) sandy clay mottled with 10YR 4/6 (dark yellowish brown) sandy clay; compacted	1.3
	D	10YR 4/2 (dark reddish gray) mottled with 10YR 4/1 (dark gray) clay	1.2+
		Cement Pier	1.5
9	A	10YR 3/3 (dark brown) silty loam	0.3
	B	10YR 4/4 (dark yellowish brown) silty clay	0.2
	C	10YR 3/2 (very dark grayish brown) silty clay containing cinders, ash, coal, brick, and mortar	0.3
	D	10YR 6/6 (brownish yellow) fine sand; compacted	0.2

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
9(cont.)	E	10YR 3/1 (very dark gray) silty clay containing cinders, ash, slag, and mortar; very compacted	0.6
	F	7.5YR 4/4 (brown/dark brown) sandy clay containing brick fragments and iron concretions	0.4+
10	A	10YR 3/4 (dark yellowish brown) silty loam mottled with 10YR 5/6 (yellowish brown) clay and containing charcoal, slag, brick, and mortar	0.9
	B	10YR 3/3 (dark brown) silty clay loam containing brick, charcoal, and mortar	0.7
	C	10YR 3/1 (very dark gray) and 10YR 2/1 (black) silty clay containing cinders, slag, brick, and mortar	1.5+
	D	10YR 5/6 (yellowish brown) silty clay	1.7+
11	A	10YR 4/3 (brown/dark brown) silty loam	0.6
	B	10YR 4/2 (dark grayish brown) sandy loam containing mortar, cinders, ash, and mudstone fragments; very hard and compacted	1.1
	C	10YR 5/6 (yellowish brown) sandy clay	0.5
	D	10YR 3/1 (very dark gray) silty clay containing ash, cinders, and mortar; very compacted	1.2+
	E	7.5YR 4/4 (brown/dark brown) sandy clay; very compacted	0.6+

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
12	A	10YR 4/2 (dark grayish brown) sandy loam	0.4
	B	10YR 5/4 (yellowish brown) clayey loam	0.2
	C	10YR 4/3 (brown/dark brown) silty loam containing brick, mortar, small pebbles, and mudstone fragments; compacted	0.3
	D	10YR 2/1 (black) cinders and slag	0.4
	E	10YR 8/4 (very pale brown) fine sand	0.2
	F	7.5YR 5/6 (strong brown) dense clay mottled with 10YR 7/2 (light gray) and 7.5YR 4/4 (dark brown) clay and containing flecks of brick	1.0
	G	Oyster Shells with 10YR 3/2 (very dark grayish brown) silt; very little soil matrix	1.5
	H	10YR 4/4 (dark yellowish brown) sandy clay mottled with 10YR 7/2 (light gray) clay; compacted	1.5+
13	A	10YR 4/3 (brown/dark brown) silty loam	0.8
	B	7.5YR 4/6 (strong brown) sandy clay	0.3
	C	10YR 3/1 (very dark gray) clay; compacted	1.6
	D	10YR 3/1 (very dark gray) clay mottled with 10YR 5/2 (grayish brown), 2.5YR 4/6 (red), and 10YR 6/6 (brownish yellow) clay	1.2+

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
14	A	10YR 4/3 (brown/dark brown) silty loam	0.3
	B	10YR 5/4 (yellowish brown) silty loam	0.4
	C	2.5YR 4/6 (red) clay mottled with 5YR 8/2 (pinkish white) clay and 10YR 5/4 (yellowish brown) silty loam and containing cinders and brick	0.4
	D	2.5Y 3/0 (black) cinders	0.2
	F	10YR 6/8 (brownish yellow) sandy silt mottled with 10YR 8/1 (white) clay	0.3
	G	10YR 4/6 (dark yellowish brown) silty clay mottled with 2.5YR 4/6 (red), 10YR 4/1 (dark gray), and 10YR 7/1 (light gray) clay and containing some oyster shells	0.5
	H	Oyster Shells; very little soil matrix	1.1
	I	10YR 4/4 (dark yellowish brown) clay mottled with 2.5YR 4/6 (red), 10YR 4/1 (dark gray), and 10YR 7/1 (light gray) clay	0.3+
15	A	10YR 3/3 (dark brown) silty clay loam	0.4
	B	10YR 5/3 (brown) clay mottled with 10YR 5/1 (gray), 10YR 7/3 (very pale brown), and 2.5YR 4/4 (reddish brown) clay	0.7
	C	Same as Stratum B, but sandier and less compacted	0.6
	D	Oyster Shells, no soil matrix	0.6+

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
16	A	10YR 3/3 (dark brown) silty loam	0.5
	B	7.5YR 4/6 (strong brown) sandy clay	0.4
	C	10YR 2/1 (black) slag and cinders	0.5
	D	10YR 5/3 (brown) silty loam	0.2
	E	Oyster Shell; no soil matrix	1.1
	F	2.5YR 4/6 (red), 10YR 5/2 (grayish brown), and 10YR 6/6 (brownish yellow) clay	1.2+
17	A	10YR 5/8 (yellowish brown) silty loam	0.3
	B	10YR 5/6 (yellowish brown) silty clay loam	0.2
	C	10YR 4/4 (dark yellowish brown) silty clay loam mottled with 5YR 5/6 (yellowish red) clay and containing cinders	0.2
	D	5YR 5/6 (yellowish red) silty clay	0.4
	E	10YR 2/1 (black) cinders	0.1
	F	10YR 6/8 (brownish yellow) sandy silt mottled with 10YR 7/6 (yellow) and 10YR 3/2 (very dark grayish brown) silt	0.2
	G	10YR 2/1 (black) cinders	0.1
	H	Oyster Shells; no soil matrix	1.6
	I	10YR 4/4 (dark yellowish brown) wet sand mottled with 7.5YR 2/0 (black) oily sand	0.3

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STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
17(cont.)	J	7.5YR 4/4 (brown/dark brown) dense clay	0.3+
18	A	10YR 4/3 (brown/dark brown) silty loam	0.3
	B	10YR 4/4 (dark yellowish brown) silty clay	0.4
	C	10YR 3/1 (very dark gray) cinders and coal	0.3
	D	Oyster Shells and stone rubble	1.1
	E	10YR 4/2 (dark grayish brown) silty clay	0.5
	F	10YR 3/1 (very dark gray) silty clay	0.3
	G	7.5YR 4/6 (strong brown) clay; compacted	0.3+
19	A	10YR 5/3 (brown) silty loam	0.3
	B	10YR 4/4 (dark yellowish brown) silty clay loam	0.3
	C	10YR 2/1 (black) slag and cinders	0.6
	D	10YR 6/8 (brownish yellow) sand containing mortar; compacted	0.1
	E	10YR 8/2 (white) and 10YR 8/4 (very pale brown) sand	0.3
	F	10YR 4/2 (dark grayish brown) silty loam mottled with 10YR 6/8 (brownish yellow) clayey silt loam	0.2
	G	Oyster Shells and stone rubble	1.6

APPENDIX C

STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
19(cont.)	H	10YR 3/3 (dark brown) loam mottled with 7.5YR 5/8 (strong brown) loam and containing brick rubble	0.3+
	I	10YR 5/8 (yellowish brown) clay mottled with 7.5YR 7/0 (light gray) clay	0.1
	J	7.5YR 4/6 (strong brown) wet clay	0.1+
20	A	10YR 3/3 (dark brown) silty clay loam	0.4
	B	10YR 4/4 (dark yellowish brown) silty clay loam	0.6
	C	7.5YR 3/0 (very dark gray) cinders	0.4
	D	10YR 5/8 (yellowish brown) silty clay mottled with 2.5YR 4/6 (red) and 10YR 4/1 (dark gray) dense clay	0.9- 3.0
	E	10YR 4/3 (brown/dark brown) sandy clay loam	0.3
	F	Oyster Shells; no soil matrix	0.4
	G	10YR 4/4 (dark yellowish brown) sandy loam	0.6
	H	10YR 5/6 (yellowish brown) silty sand loam containing brick and mortar fragments	0.3
	I	10YR 3/6 (dark yellowish brown) sand containing some oyster shells and charcoal	0.4
	J	10YR 6/6 (brownish yellow) sandy mortar with pockets of brillant white mortar (no Munsell match)	0.5

APPENDIX C

STRATA SUMMARY

MACHINE TEST	STRATUM	DESCRIPTION (color*/texture)	THICKNESS (feet)
20(cont.)	K	10YR 3/3 (dark brown) silty clay containing flecks of brick	0.1
	L	10YR 3/3 (dark brown) clay; very dense (backhoe could barely excavate it)	0.3+
	M	10YR 5/4 (yellowish brown) silty clay	0.1

As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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